

SCHEDULING TECHNIQUES AND COMPUTER TERMS

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SCHEDULING TECHNIQUES¹

1. These techniques are used to organize the execution of projects. They are often involved in capital improvements programming.
2. The following three techniques are the most commonly addressed in planning literature.
 - **Gantt Charts:** In a Gantt Chart, the various tasks involved in a project are listed on the y-axis, and the time period in which the project as a whole must be completed is depicted on the x-axis. The time period allotted to each individual task is represented as a horizontal bar. Thus, Gantt Charts organize and allocate time among these tasks.
 - **PERT:** A PERT system graphically depicts the relationships among a project's constituent tasks as links in a web. PERT systems are capable of reallocating the available resources (e.g., time, labor, materials, etc...) among these tasks (where feasible) to keep the project on-time and on-budget. A probability technique – which involves estimations of the most optimistic, pessimistic, and realistic resource amounts needed to complete each task – is used to identify the constraining relationships among the tasks that will dictate the resource requirements of the project as a whole.
 - **Critical Path Method (CPM):** CPM is used to determine the “optimal solution.” i.e., the allocation of resources (e.g., time, labor, materials, etc...) among a project's constituent tasks that will complete the project using a minimal amount of each resource. CPM accomplishes this by estimating – for each task – a *crash cost* (finishing the task in a minimum amount of time by using unlimited labor and materials) and a *crash time* (finishing the task with minimum amounts of labor and materials by using an unlimited amount of time). CPM can be used within a PERT system.
3. Computer software is often used to implement these scheduling techniques.

COMPUTER TERMS²

- Alphanumeric data: Data that consists of letters, numbers, or other characters which *are not* used in a mathematical formula
- Numeric data: Data that consists of characters which *are* used in a mathematical formula
- ASCII: (American Standard Code for Information Interchange) A code that represents 128 characters as numerals – including letters, numbers, “backspace,” and “return”
- Attribute: A piece of information that is tied to a specific object on a map
- BPS: Bits Per Second

¹ Page, G. William. “Using Project Management Software in Planning.” *Journal of the American Planning Association*. Autumn 1989: Pages 494-499.

² Puryear, Sharon. “Glossary of Computer Terms.” *Study Manual for the Comprehensive AICP Exam of the American Institute of Certified Planners*. Chapter Presidents Council, the American Planning Association, November 1999. Pages 222-229.

- Byte: A group of binary bits used to represent a character... there are either 8, 16, or 32 bits in a byte
- Cadastral map: A map that graphically defines the ownership of land... tax maps are cadastral
- Field: A component of a database record
- Fixed length record: A database record with fields that are (1) always the same size, and (2) assigned uniform locations within the record based on their contents
- Variable length record: A database record with fields that are (1) not always the same size, or (2) not assigned uniform locations within the record based on their contents
- Geocoding: The process of assigning X and Y coordinates to records in a database, so that the information in the records can be displayed as objects on a map
- Geographical Information System: A GIS is a computerized mapping system that can (1) tell what exists at a specific location, (2) find locations that satisfy given requirements, (3) spot changes in an area over time, (4) identify patterns, and (5) model scenarios. GIS systems can be either raster or polygonal. Currently, there is a push towards developing *metadata* standards that will facilitate the sending and sharing of GIS data.
- Importing: A process where one program loads a file as input that is the output of a second program
- Integrated programs: Programs like Microsoft Works
- Operating system: A collection of programs that control the overall operation of a computer... for example, Windows and UNIX
- Peripheral equipment: Sub-units of a computer system besides the Central Processing Unit... they are often external, and are usually used to input, output, or store data
- Random Access Memory: Memory in which the time to store or retrieve data is not affected by the previous bit of data handled
- Record: A group of data fields
- Relational database: A database that allows data to be retrieved or edited based on set relationships among the involved data and their locations
- UNIX: An operating system designed to be used by several users at the same time... Internet servers often use UNIX
- TIGER: (Topologically Integrated Geographical Encoding and Referencing) A street network file, with X and Y coordinates, used by the U.S. Census. It is sometimes used as a municipal GIS base.
- Domain name: The name of an internet site, such as "www.espn.com." The more specific parts of a domain name appear on its left side.
- Host: On a network, a host is any computer that is a repository for services available to the other computers on the network
- HTML: (Hyper Text Markup Language) A computer language used for laying out documents and hyperlinks on the Internet
- HTTP: (Hyper Text Transport Protocol) The major protocol for moving files that contain hypertext across the Internet... HTTP is the most important protocol on the World Wide Web

- IP Number: An identification number -- each machine on the World Wide Web has one (most have domain names too)... An IP number is composed of four parts, separated by periods
- URL: (Uniform Resource Locator) A standard manner of giving domain names or Internet resource addresses
- Web server: A machine that feeds requested documents and media to Internet browsers
- JAVA: This is a programming environment designed by Sun Microsystems. In this environment, source code (in a machine-based computer language) is partially compiled into a generic language that is interpreted on the fly as it passes through the recipient computer's processor. JAVA resides in the computer network itself, and not in any one machine. This is vital to the operation of the Internet.³

³ Heikkila, Eric J. "GIS is Dead; Long Live GIS!" *Journal of the American Planning Association*. Summer 1998: Page 357.

ENVIRONMENTAL LEGISLATION AND ISSUES

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IMPORTANT ENVIRONMENTAL PLANNING BOOKS⁴

- *Man and Nature* (Marsh, 1864): Marsh presents an argument for environmental land use planning.
- *Arid Region of the United States* (Powell, 1878): Powell puts Marsh's ideas into practice and introduces the concept of "land capacity."
- *Rural Planning and Development* (Thomas Adams, 1917): Adams argues for agricultural preservation, subdivision ordinances, and land suitability analyses in Canada.
- *Natural Principles of Land Use* (Graham, 1944): Graham establishes several ecologically-based rural land classifications and develops the relationship between environmentalism and land use planning.
- *Design with Nature* (Ian L. McHarg, 1969): McHarg establishes an influential model for environmental land use planning (it involves the use of overlays... see the *cartographic approach to environmental impact analysis* below), further develops the concept of land suitability analysis, creates an ecologically-based design process, and foreshadows modern environmental policy.

THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA)

1. §101 sets NEPA's basic substantive policy. "It is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy," to avoid environmental degradation, preserve "historic, cultural, and natural" resources, and promote "the widest range of beneficial uses of the environment without undesirable and unintended consequences... *to the fullest extent possible.*" Thus, NEPA's substantive requirements are somewhat subjective and flexible.
2. However, NEPA's procedural requirements are somewhat rigid. Furthermore, the "*fullest extent possible*" language sets a fairly high standard for procedural reviews in federal courts. Each federal agency or department must consider the effects of its actions on the environment (see *Calvert Cliffs' Coordinating Committee v. United States Atomic Energy Commission*, 449 F.2d 1109 [1971]). For each involved action, §102(2)(C) requires that a "detailed statement" be prepared that describes (1) the environmental impacts, (2) the environmental costs which might be avoided, and (3) alternative measures which might alter the cost-benefit equation.
3. NEPA and its accompanying case law require the filing of an *environmental impact statement* (EIS) for a proposed federal action only when that action is "major" and has a "significant environmental impact." An *environmental assessment* is performed to determine if a particular action requires an EIS. An EIS, itself, must include...⁵
 - A description of current conditions
 - An identification of alternative means that would accomplish the action's objectives

⁴ So, Frank S., and Judith Getzels, eds. *The Practice of Local Government Planning*. Washington DC: the International City/County Management Association, 1988. Pages 119-121.

⁵ So et al. Eds. (1988) Page 129.

- An enumeration of each alternative’s environmental impacts
 - An description of the method used to determine the preferred alternative (i.e., the proposed action itself)
 - A detailed listing of the proposed action’s environmental impacts
 - A list of possible mitigations
4. For some proposed federal actions with “significant environmental” impacts (e.g., some housing projects), NEPA and its accompanying case law require a *social impact assessment* (SIA). SIA models include *ATOM 3* and *BOOM 1*. SIA usually involves the following...⁶
 - Employment, demographic, and migration projections
 - Estimations of housing and governmental service needs
 - Fiscal impact analyses (FIAs)
 - Identifying mitigation measures based on the proceeding
 5. If the *environmental assessment* for a proposed federal action finds that an EIS is not required (i.e. the action will not have a “significant environmental impact”), then a *Finding Of No Significant Impact* (FONSI) must be filed.

THE NATIONAL FLOOD INSURANCE ACT OF 1968

In providing insurance against America’s most costly type of natural disaster, this law necessitated the creation of flood insurance rate maps. These maps usually show both 500-year and 100-year floodplains.⁷

THE RESOURCE CONSERVATION AND RECOVERY ACT OF 1976

This law regulates the transportation, treatment, storage, and disposal of solid and toxic wastes.⁸

THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980⁹

1. This law established the Superfund using taxes on the chemical and petroleum industries (87% of the involved money) as well as federal and state appropriations.
2. The Superfund is used to address toxic contamination sites. The following two types of actions are possible...
 - **Remedial actions:** Such actions provide permanent solutions. They often involve cleanup.
 - **Removal actions:** Such actions do not provide permanent solutions. Removal actions include fencing off the involved site, relocating nearby residents, and providing drinking water where wells have been contaminated.
3. There are over 20,000 Superfund sites.

⁶ So et al. Eds. (1988) Pages 348-349.

⁷ Whitney, Mark. “Flood Data – Quick.” *Planning*. July 1997: Page 9.

⁸ Salvesen, David, and Douglas Porter. “The Not-So-Super Superfund.” *Planning*. August 1993: Page 8.

⁹ Salvesen et al. Page 8.

THE CLEAN AIR ACT OF 1963

1. This law was reenacted and amended in 1970, 1977, and 1990.
2. In its modern form, the Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to (1) establish air quality control regions across the country, and (2) set ambient standards for each region (these are called National Ambient Air Quality Standards, or NAAQS). State governments then make and enforce effluent regulations that will allow the NAAQS to be achieved. These regulations are contained in a State Improvement Plan (SIP).
3. In “non-attainment” and “maintenance” air quality control regions, transportation plans and programs that are financed wholly or partially with federal money are required to be consistent with the involved state’s SIP. This requirement was established by the Clean Air Act Amendments of 1990.
4. “Marginal,” “serious,” and “severe and extreme” are different types of non-attainment areas under the Clear Air Act Amendments of 1990.

THE FEDERAL WATER POLLUTION CONTROL ACT OF 1972¹⁰

1. This law was reenacted and amended in both 1977 and 1987. In 1977, its name was changed to the “Clean Water Act.”
2. The 1972 law established the National Pollutant Discharge Elimination System (NPDES). This system requires all point source discharges to acquire and maintain a permit. These permits are issued by the EPA and states with EPA approved programs.
3. The NPDES permits are used to enforce both ambient and effluent water quality standards set by the EPA.
4. The Clean Water Act authorizes the use of land use controls to minimize non-point source water pollution.
5. §404 of this law protects wetlands with the authority of the U.S. Army Corps of Engineers.

THE NATIONAL COASTAL ZONE MANAGEMENT ACT OF 1972¹¹

This law established a voluntary program for coastal states. In order to be eligible for financial assistance, each involved state had to develop a coastal zone plan based on an inventory of coastal areas that required special protection. Then, the state had to implement this plan by adopting relevant land use controls.

ENVIRONMENTAL IMPACT ANALYSIS (EIA)¹²

1. Environmental impact analyses (1) study the environmental impacts of a proposed project in a specific location, (2) consider alternatives to the project, and (3) analyze mitigation measures.
2. The environmental impact statements required by NEPA involve a form of EIA.
3. There are five approaches to EIA...

¹⁰ Gordon, Steven I. “Environmental Planning.” *Study Manual for the Comprehensive AICP Exam of the American Institute of Certified Planners*. Chapter Presidents Council, the American Planning Association, November 1999. Page 129.

¹¹ Gordon. Page 129.

¹² So et al. Eds. (1988) Pages 127-130.

- **The Ad Hoc Approach:** This approach involves obtaining “best estimates.”
- **The Checklist Approach:** This approach involves using an appropriate checklist.
- **The Matrix Approach:** This approach uses a table, with competing alternatives forming the columns and impact classifications forming the rows.
- **The Network Approach:** This approach involves tracing an action through multiple iterations. It is good at identifying secondary impacts.
- **The Cartographic Approach:** This approach involves the use of several maps – each containing relevant environmental information – in an overlay fashion. See Ian McHarg, above.

SUSTAINABILITY¹³

1. The concept of sustainability involves social equity, economic prosperity, and environmental integrity. More importantly, it favors the minimization of resource use over the maximization of consumption. Although this has implications in several planning fields, it most directly speaks to land use planning.
2. Sustainability has roots in the following books...
 - *The Population Bomb* (Paul Ehrlich, 1968): Ehrlich predicts that humanity’s expanding population and consumption will shortly exhaust the Earth’s resources.
 - *The Limits of Growth* (The Club of Rome, 1972): This book states that Ehrlich’s prediction will come true within a century.
 - *Steady State Economics* (Herman Daly, 1977): Daly endorses the minimization of production and consumption (as opposed to the maximization). He then explores the mechanics of an economy based on this concept.
3. The United Nations addressed sustainability through the Brundtland Commission (1987), the Rio Earth Summit (1992... note that this summit produced the document *Agenda 21*), and the Habitat II Conference in Istanbul (1996).

WELLHEAD PROTECTION ORDINANCES

1. These ordinances usually (1) define three zones around a wellhead, and (2) regulate activities within those zones so that the threat of aquifer contamination is minimized.
2. The three zones that are usually addressed in wellhead protection ordinances are as follows...
 - **Primary Recharge Area:** Water in this area flows directly into the well’s aquifer.
 - **Secondary Recharge Area:** Water in this area flows directly into the well’s primary recharge area.
 - **Tertiary Recharge Area:** Water in this area flows into the well’s primary recharge area over a longer period of time.
3. The geographic locations of these zones are usually the most legally vulnerable part of a wellhead protection ordinance.

¹³ Krizek, Kevin J., and Joe Power. *A Planners Guide to Sustainable Development* (Planning Advisory Service Report Number 467). The American Planning Association. Pages 7-11.