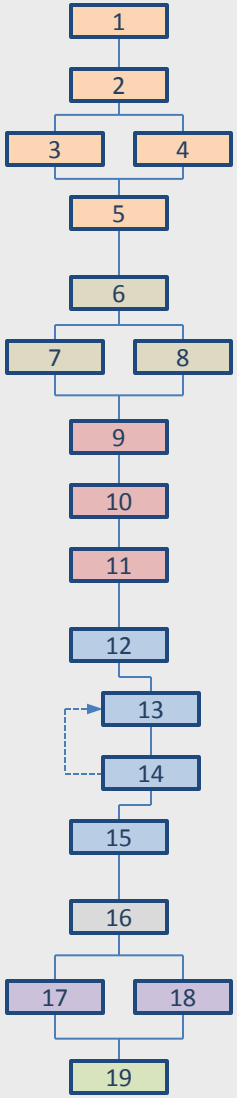
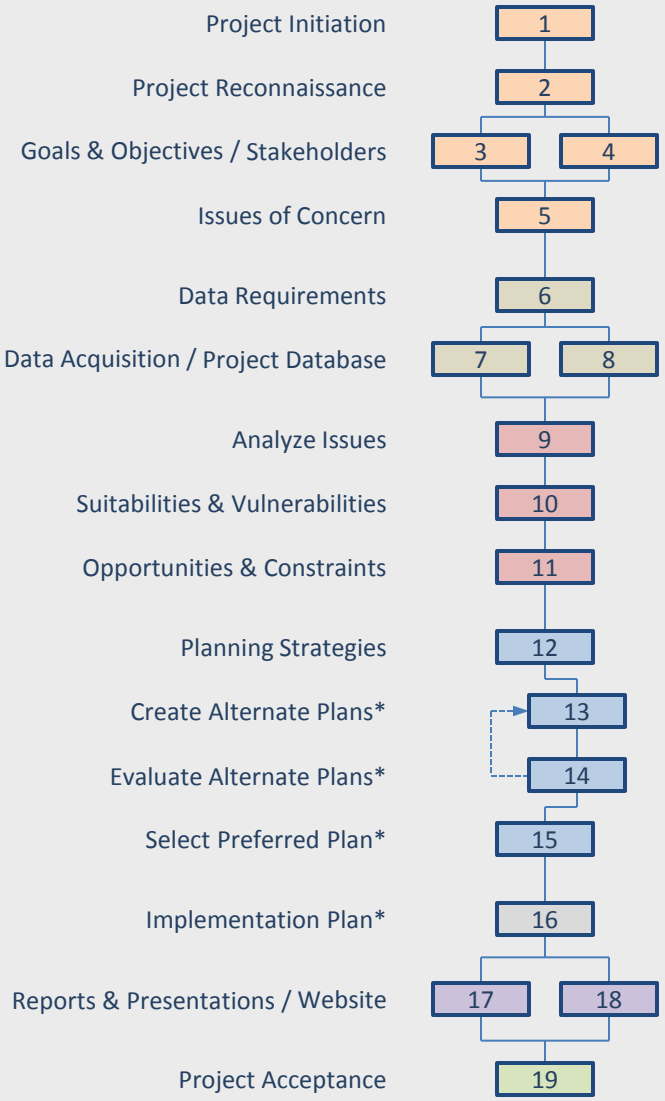


Geodesign: Project Workflow

Bill Miller, formerly Director of GeoDesign Services for Esri
wrmiller@wrmdesign.com

5/24/2015

The Geodesign Project Workflow



* The word *Plan* can refer to a *land use plan*, *transportation plan*, *conservation plan*, *response plan*, or an *action plan.*

Introduction

The essential aspect of geodesign is the idea that design, the process of creating or modifying some portion of the environment (such as the creation of a proposed land use plan), occurs within the context of geographic space, that is, where the elements of the proposed plan are geo-referenced to that space, thereby allowing the designer to take advantage of, or to be informed by, other information geo-referenced to that same space.

This referential link between the entity being designed and its geographic context provides the tangible basis for doing both science-based and value-based design.

While geodesign is often associated with sketching, the full process (workflow) involves many geo-spatially related activities from data management, to analysis, to design, to evaluation, to the final selection of a preferred plan.

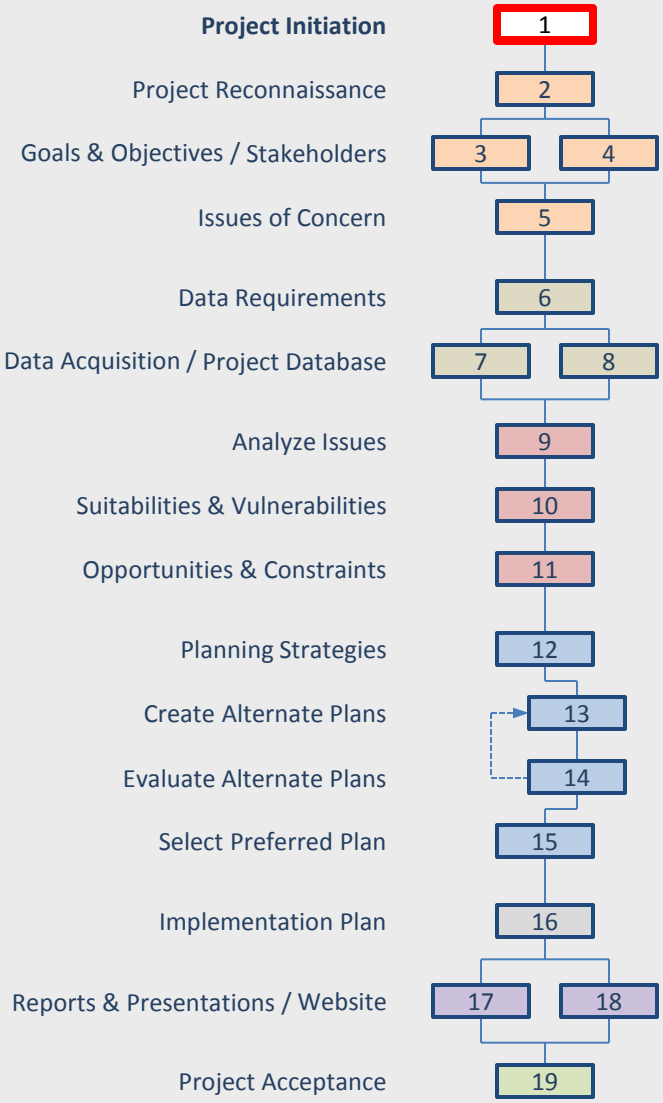
The process, while shown here as relatively linear, is actually a non-linear process filled with jumps and reversals as one encounters errors and new considerations. It is also a highly iterative process as performing the work in one task can often lead to the need to reconsider some previous task.

A detailed description of this process is more fully described in the following document:

A Framework for Geodesign, Carl Steinitz, Esri Press, 2012

The purpose of this document is to provide the reader with a general understanding of this process, as viewed through the eyes of a planner or designer (typically someone who is less familiar with GIS technology).

The Geodesign Project Workflow



Task 1 – Project Initiation

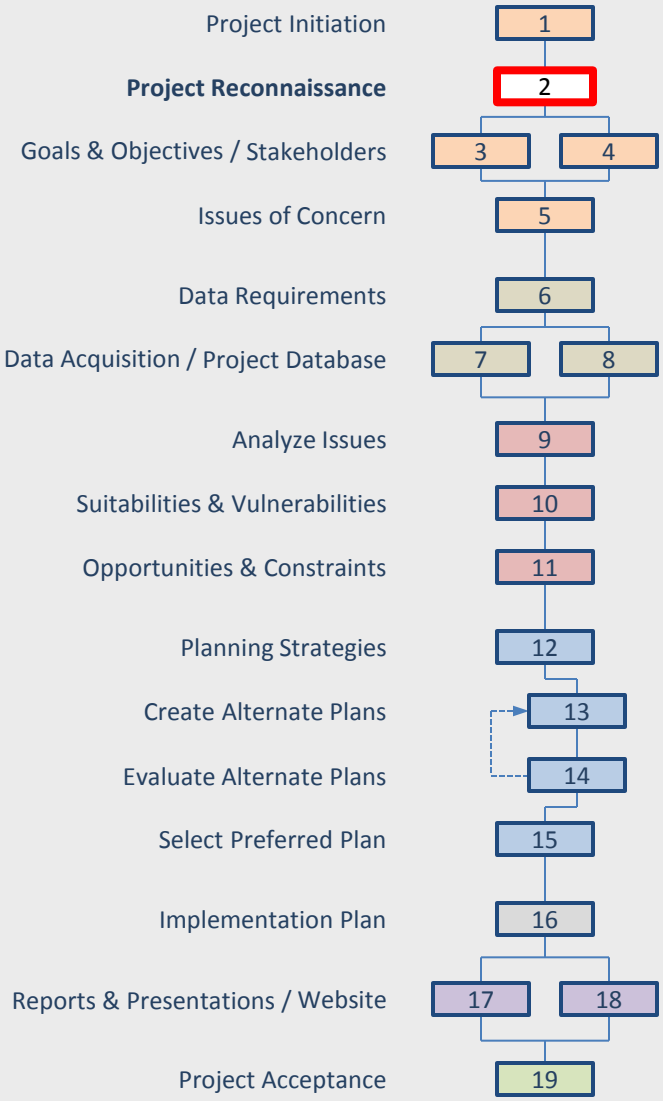
Project initiation generally begins with an agreement, either formal or informal, between the project sponsor and those responsible for doing the work. The principal members of the team (including the sponsor's representatives) are then assembled to review the intent of the project.

This orientation process involves a review of the underlying vision for the project (why it is important), the general purpose of the project, and the various goals and objectives that need to be achieved to meet that purpose.

The study area is confirmed, including the general location of the project, the extent of the greater study area (the geographical context for the project), and the project boundary (the specific area designated for proposed change or activity). Once this is done, the team reviews the proposed scope of work and assigns primary responsibilities to the principal members of the team.

Each of these activities, along with their associated assumptions, decisions, and assignments should be documented, reviewed, and generally agreed to by all members of the project team.

The Geodesign Project Workflow



Task 2 – Project Reconnaissance

Project reconnaissance involves a number of activities associated with searching out, gathering, and reviewing pertinent information about the project.

Information can be gathered from a variety of sources: government agencies, community groups, special interest groups, local planning professionals, as well as many others who may, in some way, be connected to the project or who have domain expertise relevant to the project.

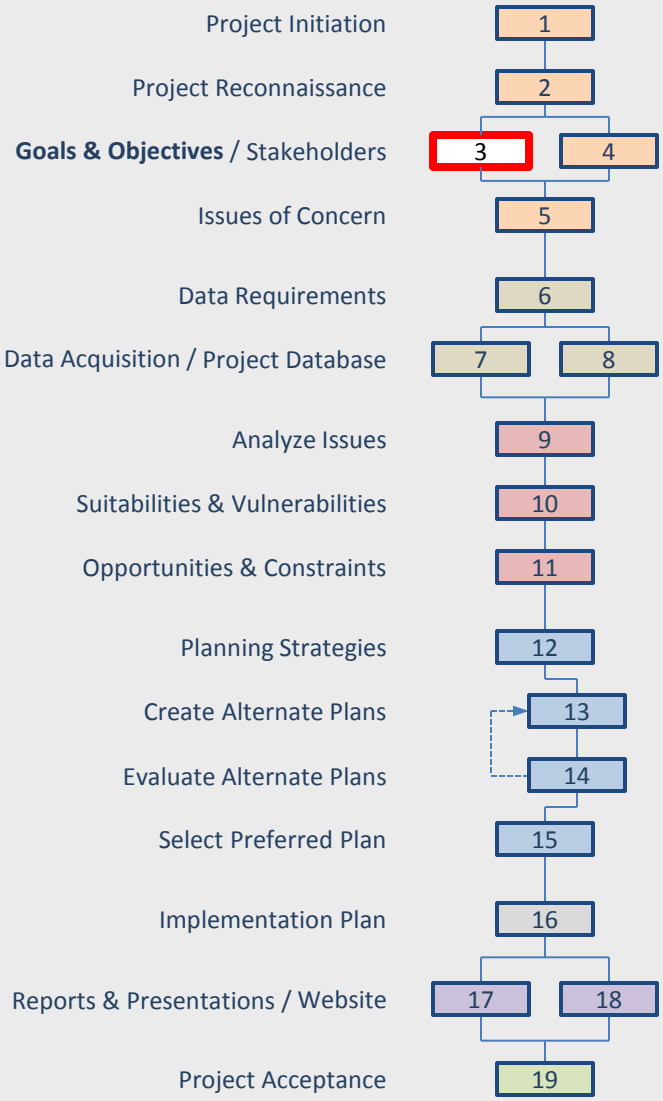
Additional information can be derived by reviewing the current laws and policies governing the project as well as a review of any previously proposed plans.

Information, of particular interest to those working on a geodesign project, is derived from an assessment of the project's geo-spatial infrastructure, including its content, how it is organized, and how that content can be accessed by the project team.

The primary objective of this task is to identify and understand the relevant conditions internal to the project (those conditions that have direct influence on the project) and those external to the project (effecting the context of the project).

The results of this task should be well documented and managed, providing ready access to the information as needed through out the project.

The Geodesign Project Workflow



Task 3 – Goals & Objectives

An initial understanding of the project's goals and objectives is reviewed and discussed during the Project Initiation task. The purpose of this task is to expand, define and refine this understanding, given the benefit of the information obtained during the Project Reconnaissance task, and in conjunction with a review of stakeholder interests.

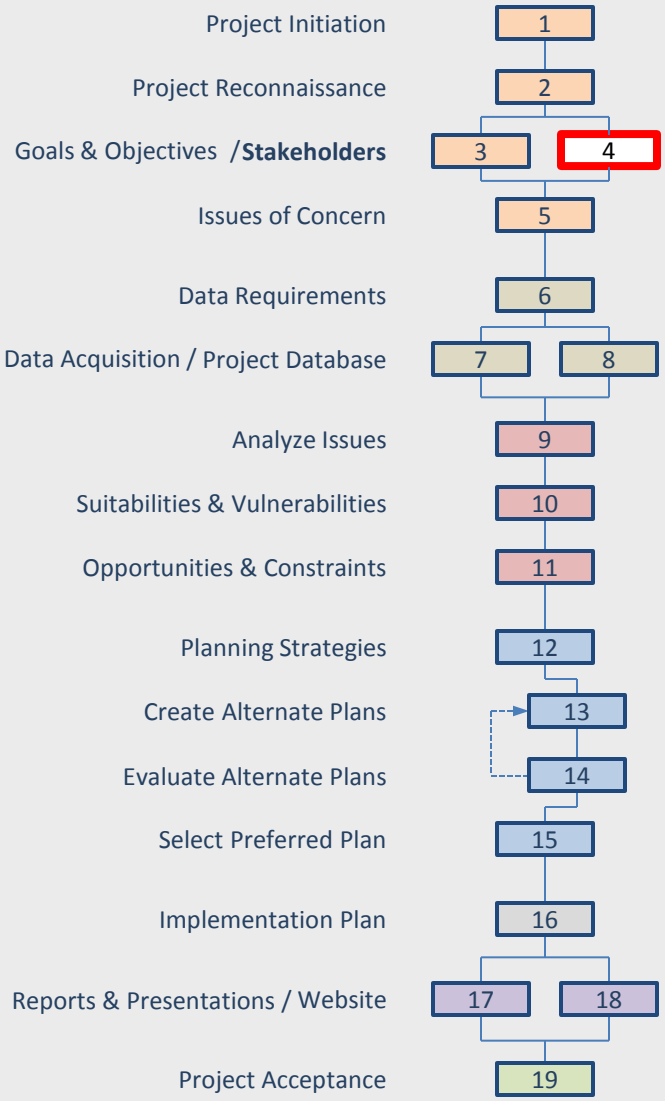
Defining the project's goals and objectives includes the development of a clear vision statement, a general description of the project's goals (what is to be achieved) and objectives (the measures of achievement).

The context for the project (including its, social, economic and geographic context), relevant history (looking at what others have done, or attempted, with respect to meeting the project objectives), and a clear description of what the project's sponsors hope to achieve with respect to performance, return on investment, and their sense of social responsibility.

These objectives serve as the basis for the development of an initial (preliminary) description of the most important performance goals for the project, most particularly with respect to use of land, including the type, quantity and quality of that use over time. As far as possible, these goals should be referenced to measureable units (e.g. quantities, growth rates, ratios, etc.) indicating the preferred levels of achievement.

The delineation of these goals and objectives provides the basis for developing a clear understanding of the general conditions of the project, including contractual matters, organizational expectations, the use of project resources, and a layout of the time and cost constraints affecting the both level of effort and the overall duration of the project.

The Geodesign Project Workflow



Task 4 – Stakeholder Interests

Stakeholders consist of individuals or groups (not part of the project team) who have an explicit interest in the project. While it is not always the case, stakeholders typically offer or advocate a value proposition concerning one or more aspects of the project.

Government agencies, non-governmental agencies (NGOs), community organizations, local professionals, concerned citizens, even individuals can be stakeholders, depending on their jurisdiction, level of interest, or degree of influence.

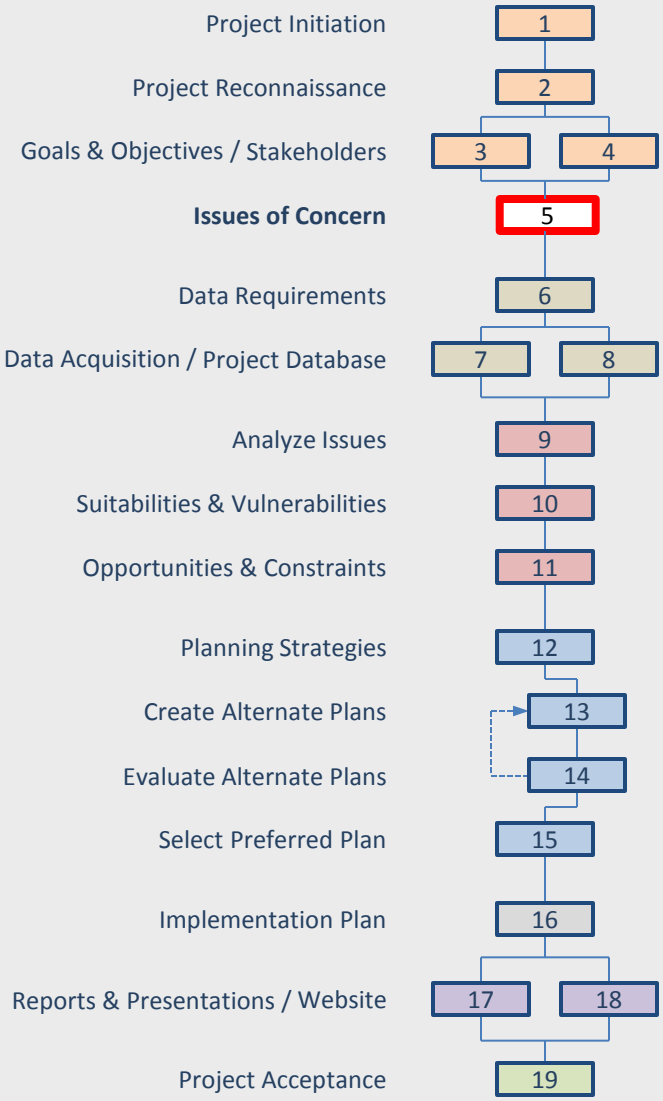
The main purpose of this task is to identify those stakeholders who have the ability, either directly or indirectly, to influence the project. While many of the stakeholders will be identified during the Project Reconnaissance task, others will be identified as the team assesses the project objectives (described in the previous task), or as they meet with those previously identified.

The process of stakeholder identification, interaction, and related information processing, is an on-going task that typically requires its own workflow; a workflow that is often unique for a specific project.

The purpose of this task is to provide an initial identification of the project stakeholders and to gain some sense as to their interests, degree of influence, and what they can bring to the project (information, services, value judgments).

With the exception of the incorporation of stakeholder values, as described in the Suitabilities and Vulnerabilities task, the identification of a more comprehensive stakeholder workflow lies beyond the scope of this document (describing the geodesign process).

The Geodesign Project Workflow



Task 5 – Issues of Concern

An issue of concern is something that needs to be resolved or better understood with respect to satisfying the objectives of the project. In general, it is something that can be measured on a value scale, such as seismic risk (which can be measured from low risk to high risk).

One of the objectives of this task is to identify the relevant issues in measurable terms and to describe why they are important to the project. It is also important to identify which of the issues can be represented in geographic terms (can be mapped) as well as their relative degree of importance and any interaction that may exist, or potentially exist, between issues.

Various strategies regarding scale, taxonomy, and resolution should be considered with respect to how each of the issues is to be represented and analyzed to help the team resolve or better understand the nature and interactions of each issue.

This task frequently draws on multidisciplinary knowledge regarding the science, methods and values relevant to each of the issues. While the representatives of a single discipline will understand the knowledge associated with their discipline, they will often lack an understanding of the information relevant to the other disciplines.

Given this situation, it would be helpful to all, particularly to those consuming the accumulation of this knowledge, if the project could be supported by a project focused knowledge base, or wiki, where the participants can contribute, reference, and search for knowledge pertinent to a particular focal topic, process, or decision.

The Geodesign Project Workflow

Task 6 – Data Requirements

The data requirements for a given project depend on conditions specific to that project, giving consideration to both the project objectives and the various issues that need to be addressed.

The extent of a supportive geo-spatial data infrastructure, as identified in Task 2 – Project Reconnaissance, if there is one, does not determine what data is need (as is sometimes inadvertently assumed), only what is available.

Establishing the data requirements for a project involves an understanding of what is needed (content, format, scale, source, and reliability) with respect to the needs of the project, and a determination of what is available (content, format, scale, source, reliability, and permissions).

These two assessments (what is needed vs. what is available) forms the basis for doing a gap assessment to determine what data is missing, its value to the project, and the type and quantity of resources required to acquire that data. This assessment can also be used to establish priorities signifying the relative importance of each data type as well as its value (utility vs. cost) throughout the geodesign workflow.

The Geodesign Project Workflow

Task 7 – Data Acquisition

The results of the previous task yields a list of the geo-spatial data needed for the project, as well as the potential sources for the data. The purpose of this task is to acquire that data.

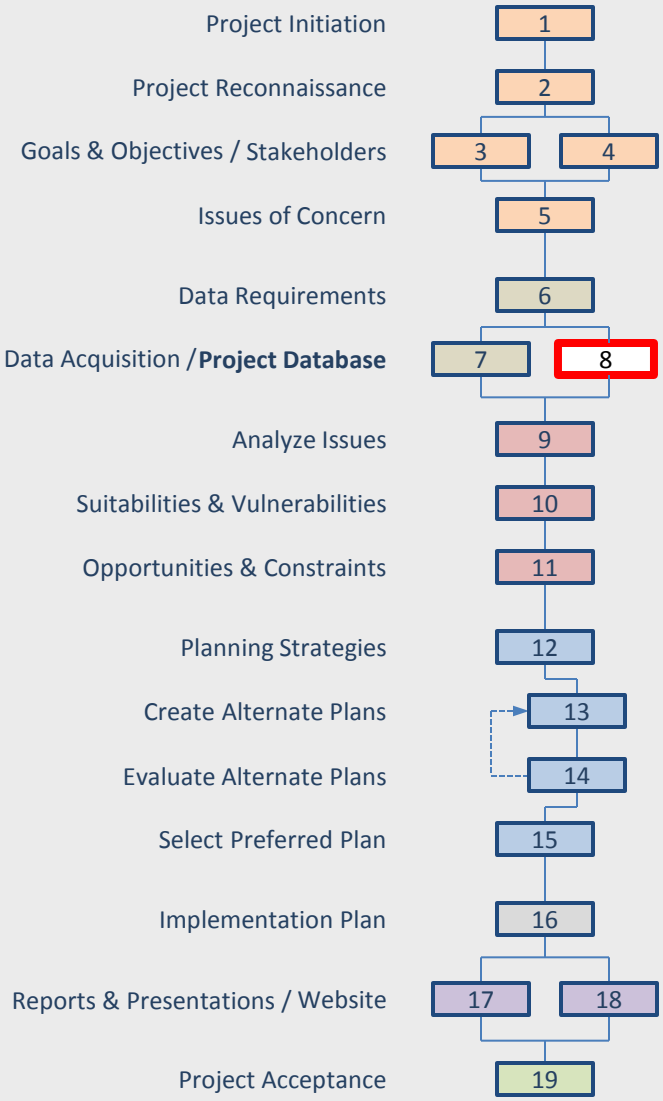
Data can be obtained through a variety of sources: public agencies, non-profit organizations, commercial providers, and in some cases even individuals. Internet portals maintained by both public and private data brokers offer, or attempt to offer, one-stop-shopping for certain types of data. Data can also be cloud sourced by tracking or monitoring messaging and behavior, which can also be referenced by location.

Local data, that is data provided by local authorities (both public and private), can also be available and is often more current, more accurate, and at a scale that more closely matches the needs of the project.

It is good to remember, however, that while data is often available from multiple sources, which can give one the impression that there is an abundance of data, it is not always available at the desired scale, in a useable format, or classified in a way that supports the needs of the project. There can also be restrictions and/or charges attached to the use of that date.

The acquisition of *project data*, that is, data that is in a form that is useful to the project, involves a review of what is available, a determination if what is available is, or can be, useful, the actual acquisition of that *available data*, and then processing that data to make it useful *project data*.

The Geodesign Project Workflow



Task 8 – Project Database

Source data acquired during the previous task, via whatever the source, is not always in a form that is readily useful to the project.

The process of converting *source data* to *project data* is not a trivial task. It involves a review of what is available, a determination if what is available is or can be made useful, an achievable strategy for making it useful, and then the execution of that strategy.

This is not always an easy task or one that can be done with minimal effort. It often involves clipping data from larger data sets, stitching together data tiles from segmented data sets, translating schema, normalizing class definitions, and converting data formats. Project budgets must be structured to accommodate this effort.

Once this is done (converting *source data* to *project data*), or sometimes as it is being done, data schemas (data type, class definitions, resolution, and cartographic representation) can be defined for each data type, cartographic standards can be specified, and base maps selected.

A geo-spatial database can then be designed to host the actual project data, or references to that data, as well as all related meta data. This database should also be designed to accommodate derivative data (data derived from the project data), all planning scenarios (alternate plans), and all geo-spatial evaluations of those plans.

The Geodesign Project Workflow

Task 9 – Analyze Issues

The principal objective of this task is to develop a comprehensive assessment of each of the issues identified in Task 5 – Identify Issues of Concern.

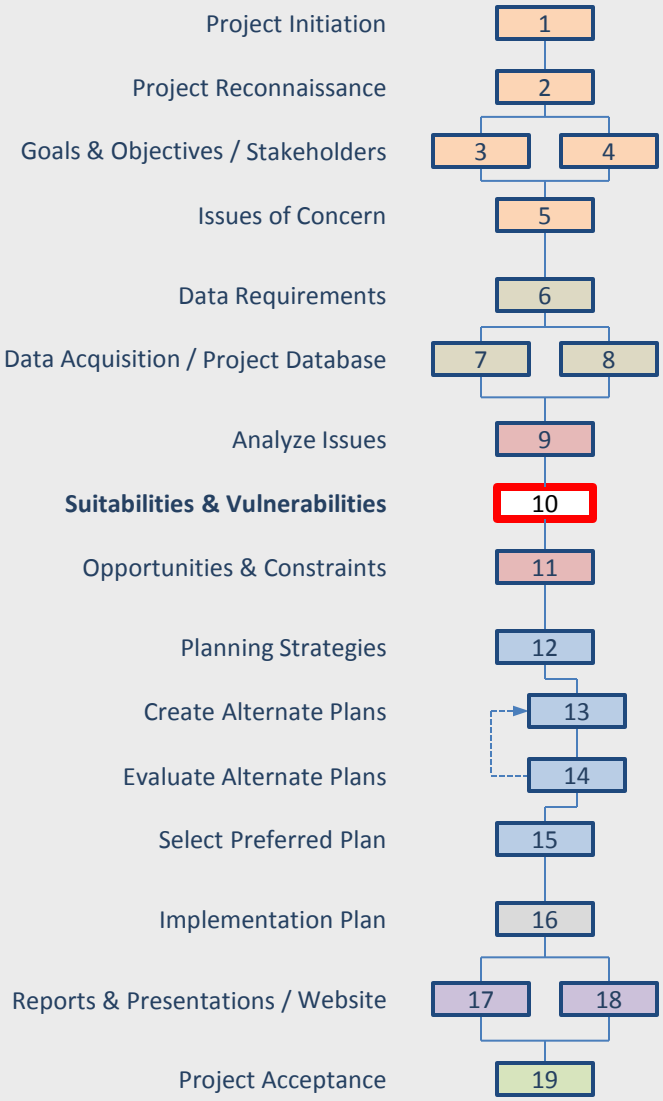
This typically involves the development of a series of assessment models (one or more for each issue) using data in the project database and various geoprocessing tools. For example, a seismic risk model might be developed using data layers showing the location, frequency and intensity of epicenters, the location of earth quake faults, and geologic subsidence, all combined, or overlaid, using a weighted overlay tool to calculate an approximation of seismic risk and for displaying that risk on a map (a seismic risk map).

The development of a geoprocessing model is typically an iterative process. As such, models need to be developed, run and tested to see if they produce an adequate approximation of the behavior and value assessments associated with the particular issue they are designed to represent. Models usually require multiple modifications before they produce valid results.

Geoprocessing models produce two types of outputs: mapped information typically showing some form of relative intensity (from low to high) and scalar values associated with particular attributes (such as the total area of all polygons of a like type). These scalar values are often used to calculate derivative values (often called performance indicators) which are then displayed using widgets (pie charts, bar charts, spider diagrams, etc.) in a dashboard.

Dashboards can be as simple as a single bar chart associate with a map, or as a series of information displays showing relevant performance indicators.

The Geodesign Project Workflow



Task 10 – Suitabilities & Vulnerabilities

Most issue assessments are domain specific, that is, their resolution typically lies within the boundary of a single discipline, or, if more broadly defined, within the realm of a set of related disciplines.

The purpose of this task is to combine the various issue assessments, performed in the previous task, into a series of composite assessments with the purpose of identifying (mapping) those areas that are either suitable for, or vulnerable to, the location of a particular land use, management strategy, or action plan.

This typically requires the simultaneous assessment of all of the issues as to what constitutes a good or bad location for a particular land use or action plan. The various disciplines must therefore work together to develop a shared set of values used to combine (overlay) the various issue maps.

Combining the issue-based assessments to measure land use suitability, for a given land use, can involve the opinion of experts as well as those of the stakeholders. Experts are typically responsible for judgments related to science and engineering systems, stakeholders usually provide judgments pertaining to community values.

Given this input, from both the domain experts and the community stakeholders, it is important to provide a mechanism, such as the Delphi process, for managing the determination and refinement of these value judgments.

If structured properly, the output from this process (the collective value judgments of the experts and the stakeholders) can be the input to the suitability and vulnerability models, which, in turn, are used to create the land use suitability maps.

The Geodesign Project Workflow

Task 11 – Opportunities & Constraints

An assessment of the various issues, analyzed in Task 9, coupled with a review of the land use suitability and vulnerability maps, created in Task 10, frequently leads to the identification of a number of opportunities and constraints with respect to what is possible, perhaps even preferred, and what is not.

This process, of reviewing what has so far been accumulated, with respect to understanding the issues and an assessment of the areas most suitable for different uses or action plans, is more intuitive than procedural. The process relies on the design team's ability to digest the various assessments and recognize patterns indicating potential opportunities as well as those that might represent a constraint.

In many respects, this marks the beginning of the creative portion of the overall geodesign process, in that it breaks from the heuristic procedures and analyses.

The purpose of this task, however, is not to design the plan or a set of alternative plans, as described in Task 13, but rather to identify selected aspects for further consideration and exploration.

The Geodesign Project Workflow

Task 12 – Planning Strategies

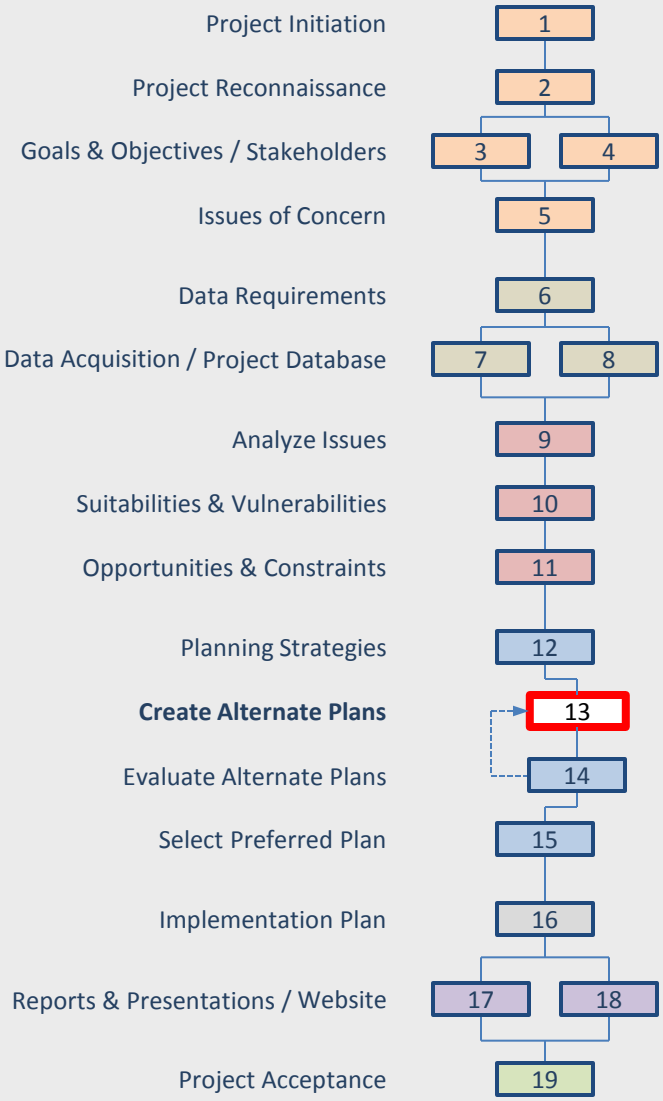
The purpose of this task is to give consideration to the planning strategies (exploration, optimization, simulation, etc.) the team might invoke as the framework for design … the processes used to create alternative solutions to the problem, that is the creation of alternative plans (land use plans, transportation plans, conservation plans, response plans, action plans … depending on the nature of the project).

These strategies are described in Steinitz's book, *A Framework for Geodesign*, recently published by Esri Press. Steinitz describes nine different strategies:

Anticipatory – a single planner who knows the solution
Participatory – multiple planners, each with a preferred solution
Sequential – moving to a solution through a series of confident choices
Constraining – planning to satisfy a set of given constraints
Combinatorial – looking at a range of potential choices in combination
Optimizing – planning to satisfy an objective function
Rule-based – planning using a set of formal rules
Agent-based – planning using agent-based simulation

While one of these may appear to be the obvious strategy, at lease initially, it is always a good idea to consider the entire list. A full consideration of all of the strategies can often lead to insights as to what needs to be assessed or resolved, as well as what might represent a good solution, or how one might present and defend a proposed plan.

The Geodesign Project Workflow



Task 13 – Create Alternative Plans

The accumulation of understanding, derived as a function of the work performed in the previous tasks, provides the context for the creation of a plan, or series of plans (alternative plans) designed to satisfy the objectives of the project.

These plans, often called scenarios, can be created (designed) following one of the prescriptions described in the previous task or without prescription relying solely on the designer's imagination. In either case, most of the available approaches will involve some form of sketching.

The act of sketching often generates ideas and suggests opportunities not previously considered. In other words, sketching is not simply the process of documenting what one as previously imagined, it is rather the graphic extension of one's imagination and occurs in sync with what is being imagined in the mind of the designer.

Given the explorative nature of one's imagination, sketching what one imagines as it is being imagined becomes a highly iterative process with many false starts, revisions, do-overs and start-overs. Portions of one plan may become the seed for the creation of another plan. Parts of one plan might be combined with parts of another plan to form the basis for the creation of a new plan. One plan might be significantly different from another plan, or simply a variation of another plan.

All of this work leads, either directly or indirectly, to the creation of a number of specific planning alternatives (scenarios), each representing a relatively high degree of value with respect to what constitutes a desirable solution.

The Geodesign Project Workflow

Task 14 – Evaluate Alternative Plans

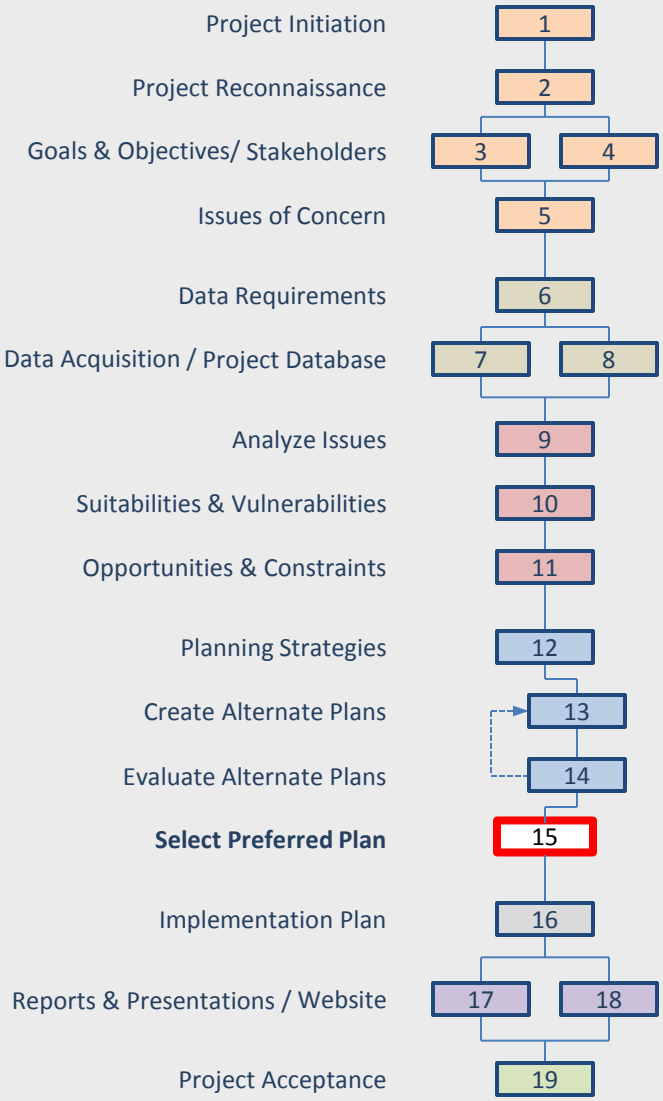
The proposed plans, created in the previous task, need to be evaluated to assess their goodness. This measure of goodness often includes a wide variety of sub-measures. While the list of sub-measures for any given project can become quit extensive, they typically fall into one of two categories: quality of life measures (livability and sustainability) and economic measures (revenue and expenses).

What is important to the designer is that he or she has access to these measures (performance indicators) throughout the design process; be it during the creation of the initial concept plan, once the evolution of that plan has reached a particular milestone, or when it is in its final form. In other words, the designer should be able to monitor selected performance indicators on-the-fly (as the plan is being created) or any stage of completion.

These on-the-fly evaluations provide valued feedback to the designer as he or she creates the plan. This feedback can, and often does, serve to redirect the creation of the plan. These intermittent evaluations occur as the plan is being created, making the creation and evaluation process seem like one integrated task.

Evaluations at the end of the creation cycle are typically more comprehensive in nature and often serve as the decision support framework designed to aid the selection process (described in the following task).

The Geodesign Project Workflow



Task 15 – Select Preferred Plan

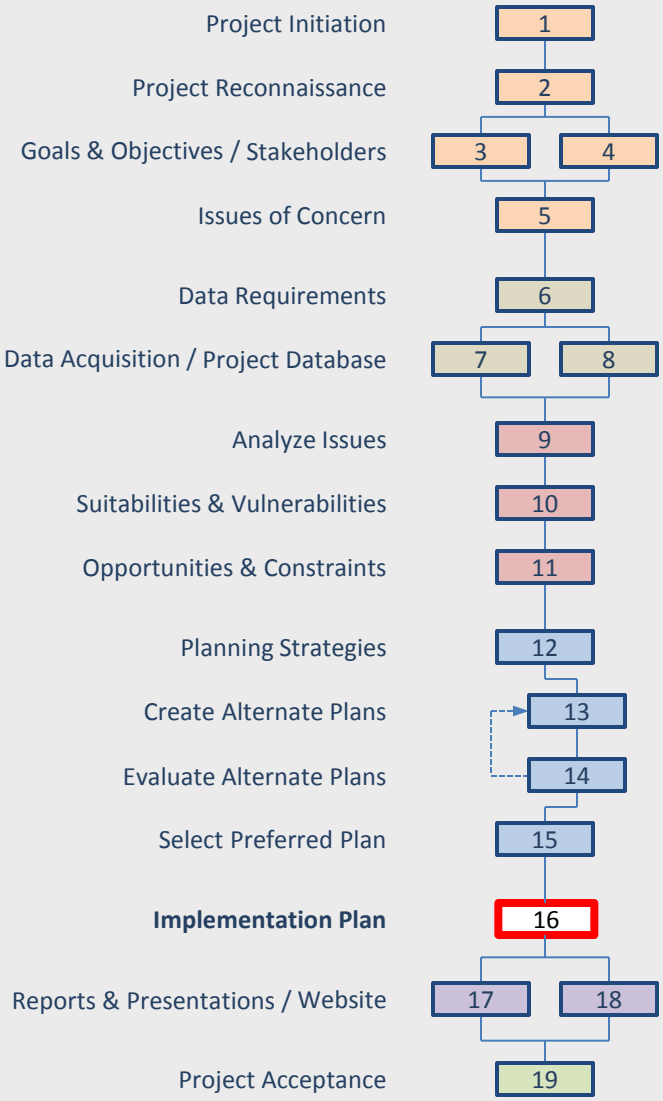
The evaluation of alternative plans (scenarios) also involves the ability to compare the proposed alternatives one to the other. This frequently includes some form of side-by-side comparison, where one plan is compare to another, or set of others.

This comparison can be done visually by simply viewing the plans side-by-side or analytically by comparing the plan's performance indicators. The preferred form of evaluation is when these comparisons can be done simultaneously, that is, when the graphic renditions of the plans can be viewed side-by-side with the performance indicators (or a selected set of those indicators).

Given the fact that projects can involve the creation of many scenarios, side-by-side comparisons are often made between a selected subset of the scenarios created for a given project. A typical comparison workflow will first involve the selection of the scenarios to be compared, followed by the comparison of those scenarios. This process of select and compare can be repeated many times as the designer explores various plans and how those plans compare to others.

The results of this process can lead to the identification of a preferred plan (or plans). It can also be used to educate the designer as to what works and what doesn't, leading to a more informed creation of a new set of plans. In either case, this task typically yields a preferred plan.

The Geodesign Project Workflow



Task 16 – Implementation Plan

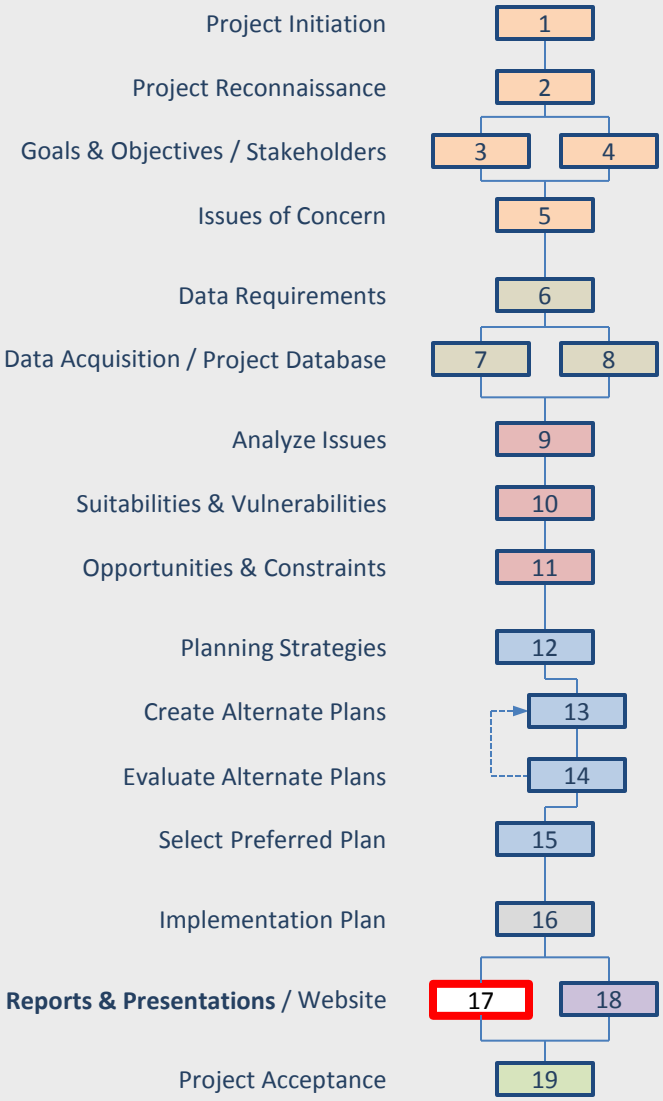
Few plans are implemented in one fell-swoop. The implementation of a specific plan is typically performed in phases over a period of time. The number of phases and their corresponding time periods depending on the type of plan, its scale, its intensity, and interactions between phases.

Phasing the implement of a plan can be as critical as the plan itself. In many ways, one can say a plan is not complete until its implementation plan has been worked out.

An implementation plan for a proposed plan, be it a land use plan, a transportation plan, a conservation plan, a response plan, or an action plan, typically involves segmenting the plan into a series of sub-plans where each sub-plan is set in relationship with the other sub-plans (e.g. it is executed in sequence or in parallel with other sub-plans). Additionally, it is often assigned, though this is not always the case, to a particular time period.

The primary objective of this task is to develop (design) an implementation plan that is efficient, with respect to the use of resources, and where each phase produces some form of utility.

The Geodesign Project Workflow



Task 17 – Reports & Presentations

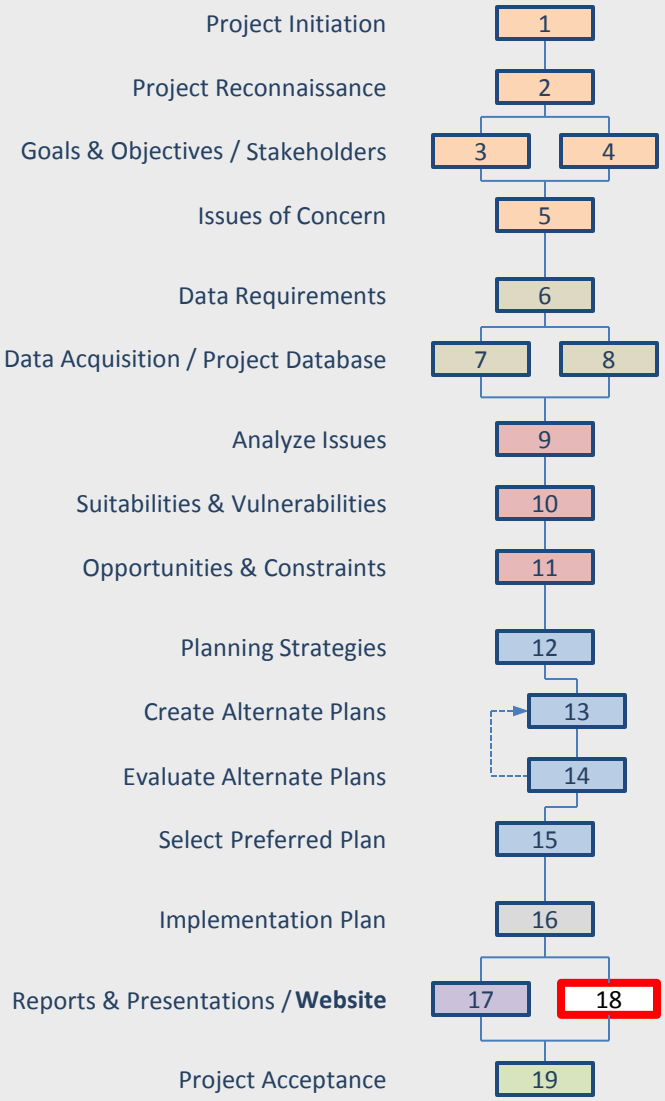
The geodesign work described in this document involves both the creation and/or use of a number of information components (e.g. map layers, evaluation tables, meta data, etc.). These components are used and referenced throughout the project. This use often involves formatting one or more of these components into a report, be it a simple table, a set of maps, a lengthy report, or some type of presentation.

While reporting can occur at anytime throughout the project, it most frequently occurs as one prepares for a project milestone or the completion of the project.

The main purpose of this task, however, is to create the final project reports and presentations necessary to communicate the results of the work to others.

These final reports and presentations contain many of the information components created through the project.

The Geodesign Project Workflow

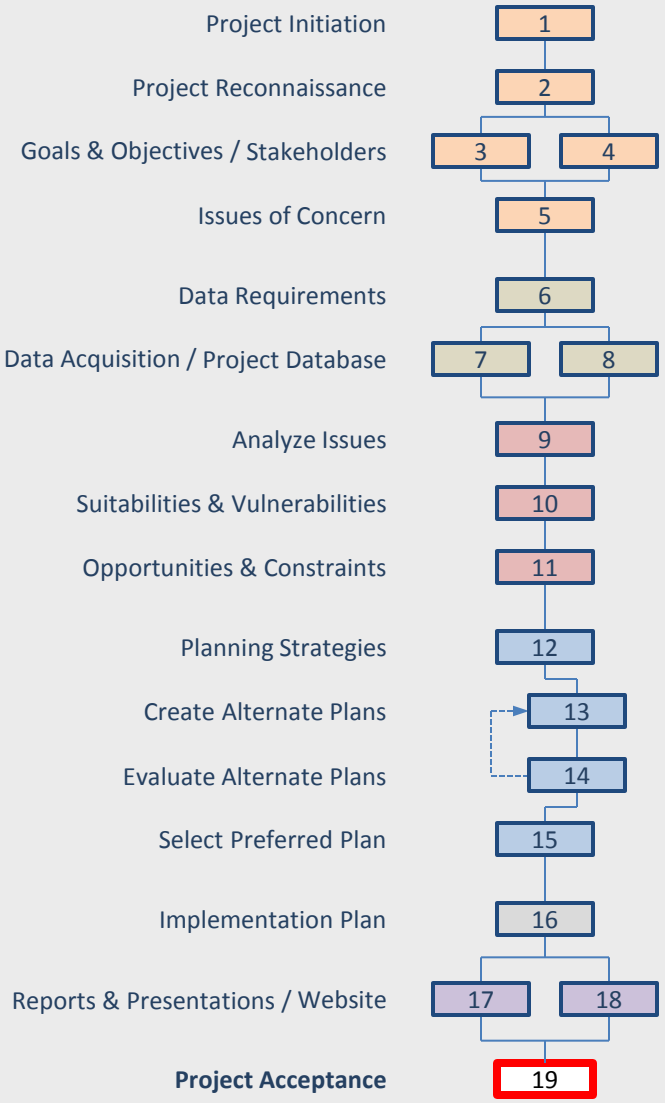


Task 18 – Project Website

In addition to reports and presentations, most projects also involve the creation of a project website which is typically maintained throughout the life of the project. The purpose of this website is two-fold: to assist the project team as they do their work, and to provide a means of communicating the results of their efforts with others outside of the project.

The website, like the reports and presentations, consumes many of the components (e.g. map layers, evaluation tables, meta data, etc.) created throughout the project.

The Geodesign Project Workflow



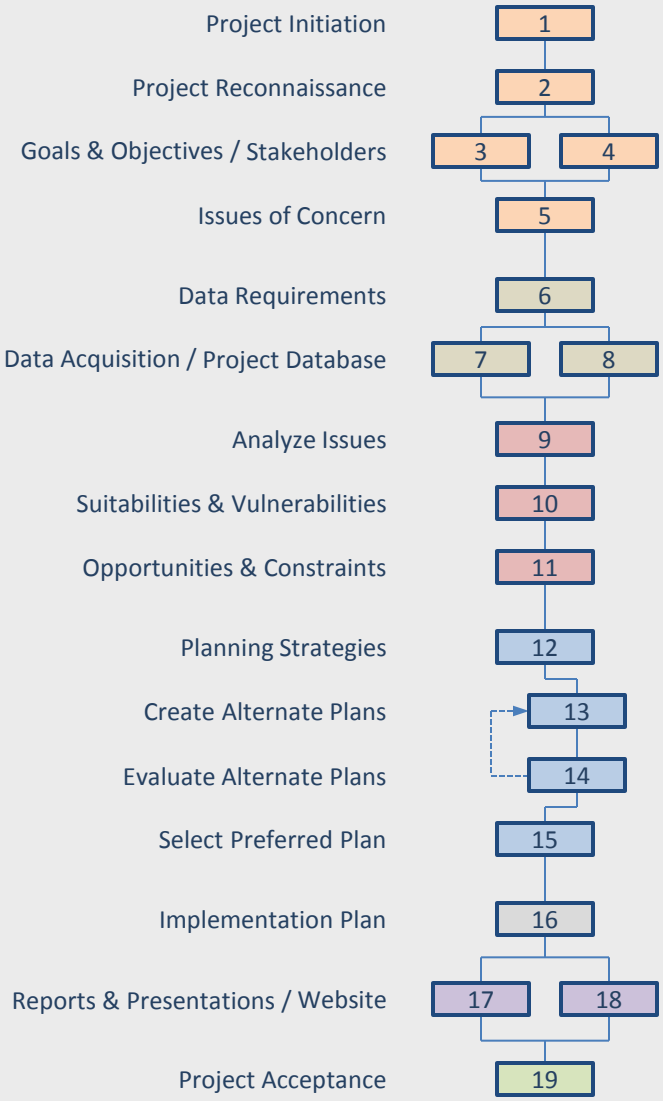
Task 19 – Project Acceptance

Perhaps one of the most important aspects for any project is the ability to gain acceptance, not only of the completed work but also for portions of that work at particular milestones.

Many of these milestone-based acceptances involve a review agency's ability to make decisions, including geo-spatial decisions, as to either the status of the work, the projected performance characteristics of the entity being designed (e.g. land use plan), or its impact on other systems (e.g. the environment, fiscal policies, etc.).

Decision support systems (DSS) and spatial decision support systems (SDSS) are often used to help facilitate this process.

The Geodesign Project Workflow



Conclusion: Project Workflow

It has been the intent of this document to provide the reader with a general overview of the workflow most often associated with a typical geodesign project.

The process, while shown here as relatively linear, is actually a non-linear process filled with jumps and reversals as one encounters errors and new considerations. It is also a highly iterative process as performing the work in one task can often lead to the need to reconsider the work performed in some previous task.

In this sense, the diagram serves as an organizational structure for monitoring the work, including reversals and iterations, giving the participants the ability to track where they are in the overall process.

A detailed description of this process is more fully described in the following document:

A Framework for Geodesign, Carl Steinitz, Esri Press, 2012

The purpose of this document is to provide the reader with a general understanding of this process, as viewed through the eyes of a planner or designer (typically someone who is less familiar with GIS technology).