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Study Guide for Test 1 title page

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What is an EIA anyway? As you can see here there are short and long definitions. Both definitions are useful to keep in mind particularly as we move forward in the class and in your personal projects that you will do for me (and for yourself).

SHORT: 'A process or set of activities designed to contribute pertinent environmental information to project or program decision-making' (Beanlands & Duinker, 1983: 18).

LONG: A process for 'determining and managing (identifying, describing, measuring, predicting, interpreting, integrating, communicating, involving, controlling) the potential (and real) impacts (direct and indirect, individual and cumulative, likelihood of occurrence) of proposed (or existing) human actions (projects, plans, legislation, activities) and their alternatives on the environment (physical, chemical, biological, ecological, human health, cultural, social, economic, built and their interrelations. (Lawrence, 2003: 7).

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In order for us to conduct an EIA regarding the building of the hotel, we had to take several pre-steps. First, identifying what the government and private sector actor's goals are. They may be overtly stated in a document somewhere, or you might need to sit and speak directly with those driving the project. As you may know, there may be stated goals that are public, and unstated goals driven by particular interests that you can only know through stakeholder analysis. Following identification of these goals, we then undertook efforts to establish a baseline for moving forward: What is known about the socio-ecological system at different scales? What do we not know and what do we need to know? Following these steps, we then developed a process for conducting the EIA.

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Sinclair and Doelle identify 8 criteria for determining best practices for an EIA

- A strong legal foundation establishes EIA as a mandatory and enforceable process, and one that provides clarity, certainty, fairness, and consistency
- A broad definition of the environment and related processes stipulates requirements to ensure EIA is applied to all environmentally significant undertakings.

- The EIA process identifies the best options rather than merely acceptable proposals, and requires critical examination of purposes and comparative evaluation of alternatives to the initiative as well as of alternative means to undertake the proposal.
- The EIA process limits ministerial discretion
- The EIA process is open and fair, provides a significant role for the public, and contains provisions for public notice, comment, access to information, and participant funding
- The EIA process has enforceable terms and conditions for approval of an initiative
- The EIA process explicitly addresses monitoring and other post-approval follow-up to ensure terms and conditions are met.
- The EIA process ensures assessment work is connected to a larger context, including establishment of overall biophysical and socio-economic impacts.

I would argue that our project met 6 of these 8 criteria. Two were not met. Regarding bullet point 3, we were told ‘make no mistake, the hotel is going to be built. It is up to you to tell us how to do it in the best possible way.’ So, we were never free to consider the notion that the best option was not to build inside the park. Also, regarding bullet point 4, Ministerial discretion was not limited, it actually set the parameters for us in doing our work. As I said above, everything is political! Was building the hotel the wrong outcome?

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A key concept in natural resources management is ‘stakeholder’. Stakeholders may be defined as follows:

“Persons or groups with a legal responsibility relative to a problem or issue, or likely to be affected by decisions or actions regarding the problem or issue, or able to pose an obstacle to a solution of the problem or issue”.

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Effective action for best practice in natural resource management requires effective communication. Do we understand things in the same way? Maybe, maybe not. Let’s establish a baseline with some key definitions:

- **Nature** refers to the totality of phenomena that are **not created by humans**, often understood as the **non-human world** governed by physical, biological, and ecological processes.

- The **natural world** is the **observable, material manifestation of nature**—the ecosystems, species, landscapes, and physical processes that exist independently of human construction.
- The **biosphere** is the **global, integrated system of all living organisms and the zones of Earth that support life**.
- The **environment** refers to the **surrounding conditions**—**natural, built, social, and institutional**—that affect organisms or societies.

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An Ecocentric perspective is a system-centred value system which holds the belief that:

Natural resources are interdependent components of ecological systems—living and non-living—that together sustain the integrity, resilience, and functioning of the Earth’s life-support systems, of which humans are a part.

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A Biocentric perspective is a life-centred value system which holds the belief that:

Natural resources are living organisms and ecological processes that sustain life, each possessing intrinsic value independent of human use, with humans regarded as one species among many.

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An Anthropocentric perspective is a human-centred value system which holds the belief that:

Natural resources are components of the natural environment that humans value, appropriate, or manage for human needs and purposes, including economic production, livelihoods, security, and well-being.

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A crucial insight for us is that in **real-world natural resource management**, policies often *blend* these perspectives:

- Anthropocentric logic dominates **law, economics, and permitting**
- Biocentric values surface in **species-at-risk and animal welfare**
- Ecocentric thinking underpins **ecosystem-based management, watershed planning, and resilience frameworks**

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This leads us to ‘stakeholder mapping’, a very important feature of natural resources management.

Stakeholder mapping is the systematic identification, characterization, and analysis of all actors who affect, are affected by, or have authority, knowledge, or interests related to natural resource management decisions, in order to design legitimate, effective, and durable policy and planning processes.

In natural resource management, stakeholder mapping is **foundational** because resources are:

- Shared across space and time
- Governed by multiple authorities
- Embedded in social, cultural, ecological, and economic systems
- Sites of power, inequality, and conflict

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Here I attempt to map out the relative closeness to the centre of power in a typical social formation, that is a sovereign state be it ‘developed’ (high resource consuming) or ‘developing’ (low resource consuming).

Power manifests in different forms: institutional, material and ideational. Institutional forms of power such as the central government, or collective management arrangements such as international organizations (the UN, the EU, the ICJ), or even markets where goods and services are traded. Material power involves elements such as money, machines, weapons. And ideational power can vary from the general (peace, freedom, justice) to much more specific (limited government, user pay, subsidized services).

Stakeholders are endowed with different forms of power, sometimes in combination of all three. In mapping out the stakeholders engaged in a land use decision, it is important to try and understand where they lie in relation to the centre of social/economic/political power and what forms of power (if any) they are endowed with.

What type of power do civil society organizations such as Greenpeace or Ducks Unlimited or the Sierra Club have? How does this compare to a private company or a provincial government?

Try to map out the stakeholders in relation to the centre of decision-making power in relation to the proposed Tantram Gas Plant issue. Having conducted this mapping, what does this knowledge tell you about arriving at a land use decision satisfactory to all stakeholders?

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Here Allan presents a schematic diagram of global water use in irrigation over time (Y axis) with different ideologies or paradigms (1st thru 5th) presented along the X axis. The most interesting

element of this diagram for me is how Western water use is in decline as management thinking reflects new thinking (paradigms 3 thru 5), but overall global water use in irrigation continues to rise as Global South actors, especially India and China, argue that they must continue with a 2nd paradigm approach if they are to ‘develop’ like the West.

The gap between the continuing rise in global use relative to the declining use in the West constitutes what he labels the ‘contentious discourse’ — whose ideas, narratives and practices are right? Why do you think so?

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As this is a course in natural resources management, we must begin with a definition. Here is my colleague at the University of Waterloo, Prof. Derek Armitage’s definition which is very helpful for us: NRM “is an **adaptive** and **collaborative** process through which actors across scales manage **social–ecological systems** to sustain ecosystem functions, livelihoods, and resilience in the face of change”

What is interesting about this definition is how what he is saying, while perhaps obvious to students concerned with sustainable development, contrasts so markedly from the dominant approach to managing resources. Notice how Armitage speaks of adaptation (not command and control), of collaboration (not top-down, expert-led decision making) and of socio-ecological systems (not a singular nature sitting inert and ready for humans to dominate as humanity moves linearly from ‘backward’ ways of life toward ‘progress’ and ‘development’.

In the latter, one might view ‘sustainable development’ as an end point to be reached. In Armitage’s (and like-minded colleagues’) view ‘sustainable development’ is a process where the ‘goal’ is to achieve ‘resilience in the face of change’, a sort of on-going adaptation to circumstances not always of our own making, not necessarily within our control, and often influenced by the choices (some) humans have made and actions taken.

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It is useful to compare Armitage’s definition with that of the Government of Canada and of Natural Resources Canada, the leading entities for resource management in the country:

For the Federal Government, natural resource management is “the sustainable development, conservation, and wise use of Canada's natural resources (land, water, minerals, forests, wildlife) for current and future generations, balancing economic prosperity with environmental protection through science, policy, regulation, and collaboration to ensure long-term benefits and competitiveness.”

As for NRCAN, they are officially “committed to improving the quality of life of Canadians by ensuring the country’s abundant natural resources are developed sustainably, competitively and inclusively”. (NRCAN homepage: <https://natural-resources.canada.ca/>)

You will recall from an earlier lecture where it was highlighted that ‘anthropocentric’, ‘biocentric’, and ‘ecocentric’ perspectives and approaches to NRM often overlap and accommodate to each other. This may be seen in the definitions above where the goal is to support the wants and needs of ‘current and future generations’ of Canadians (that is, humans), to ‘improve the quality of life of Canadians’ - i.e. anthropocentrism - while also ensuring ‘wise use’, ‘environmental protection’, ‘sustainable development’ - i.e. ecocentrism.

As we will see in subsequent weeks, reconciling these two perspectives is not so readily achieved.

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The Canadian Government definition references ‘sustainable development’ following on from the classic definition found in the Brundtland Report [Our Common Future](#) (1987), which defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

As with many concepts, the meaning of sustainable development has long been contested. At present, it finds itself further elaborated upon in the Sustainable Development Goals.

[For details, see: <https://sdgs.un.org/goals>]

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As pointed out above, Armitage’s definition can be contrasted with what we can call the ‘traditional’ definition of NRM which reached its zenith in the period starting with the Industrial Revolution in the early 1800s and ending (though none of these approaches ever really “end”) with the emergence of widespread concern over the social and environmental impacts of industrialization.

The near exponential increase in water use for irrigation between 1830 and 1980 reflects Allan’s second paradigm, ‘industrial modernity’, which he also calls the ‘hydraulic mission’. Why a mission? Because the ability to capture water for energy, for food production, for use in manufacturing, and for growing cities reflects the power of the sovereign state, and of some parts of the world over others. So, for India and China, or Brazil and Ethiopia, to capture water in the same way, is to demonstrate that they too are powerful states and not to be trifled with.

Much of our concern with natural resources has centred on inter-state competition, from early colonial and imperial days right to the present moment as our Prime Minister visits China in hopes of finding markets for our natural resources so that Canada remains ‘strong’ and therefore able to withstand political and economic pressure from our neighbour to the south of us.

Given the myriad negative consequences of development of which we are all too familiar, the unfettered use of natural resources began to be questioned from an ecological point of view beginning sometime in the 1960s-70s (paradigm 3), from an economic point of view in the 1980s (paradigm 4), and from a political point of view from the 1990s onwards (paradigm 5). Each of these paradigms agreed with the need to use resources but their perspectives were slightly different: use should not harm the environment or cause people harm through environmental degradation (paradigm 3); use should be affordable and economically efficient (paradigm 4); use

should recognize that decisions will have political consequences given that people have different interests and capacities, and will be impacted unevenly.

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My colleague and long-time friend, Prof. Ken Conca of American University, wrote a wonderful book entitled *Governing Water*. In that book he tried to map out the various ways those interested in sustainable, equitable, efficient resource use have attempted to shift governance and management from traditional approaches (the ‘is’, or the way things mostly are today) to more progressive approaches (the ‘ought’, or the way we’d like things to be managed).

While he was speaking of water resources, you could apply this attempted transformation of governance and management to any resource. As you see, when it comes to resource access and use decisions, the territory generally invoked is the sovereign state, the authority over decisions is the government (and select partners chosen by the government), and the knowledge informing action is the ‘expert’ (both technical and financial). Try to apply this to the supporters of the Tantramar Gas Plant — what do you see in this case?

For many, such as Conca and Armitage and for that matter, me, we must move away from this form of decision making toward a form of decision making where we consider the river basin as the dominant territorial unit (from mountains to sea in most cases), that authority resides with all affected stakeholders, and that all relevant forms of knowledge must be brought to bear and equally respected.

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The traditional NRM system is a linear system, built around the notion that the Earth is an endless source of resources and a limitless sink for our wastes. Hence the model shown here. In traditional resource management, discussed in some detail last class, centralized decision making begins from the idea that resources are infinite and the capacity for the Earth to absorb waste is equally infinite. This is called ‘the Cornucopian fallacy’. Such a perspective leads to linear models of production depicted here, and reducible to three words: take, make, waste.

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To summarize the traditional resource management approach, here are key characteristics:

- Reached its apex in the “high-modern industrial” age (Allan’s Paradigm 3)
- Humans manage nature
- The ‘system’ is linear and predictable (“uncertainty” is minimized or ignored)
- The primary focus is to maximize resource yield and efficiency
- The knowledge base is technical and expert-driven
- Governance is centralized, sectoral
- Characterized by top-down decisions with a “command and control” approach

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It is important that we understand governance in relation to management. Governance **defines the rules** and authority for decision-making, while management **implements** those decisions and provides feedback that enables governance to adapt over time. Put simply: **“Governance decides, management delivers”**

The image on the left is the cover of Thomas Hobbes’ famous book, *Leviathan*. Written during the brutal English civil war (1642-1651) and published at war’s end, Hobbes argued that to avoid further chaos and violence, society required a strong central authority — a Leviathan — to keep order and to ensure that the average person’s life would not be ‘nasty, brutish and short’. Human societies have forever struggled with this need for order, on one hand, but a desire for personal freedom, on the other. In resource management, we continue to recognize the need for rules and regulations, but who should make them and how should they be enforced?

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I want to focus on the bottom two bullet points: that governance is centralized and sectionally focused (e.g. ‘water’, ‘fish’, ‘forests’, ‘mining’); and characterized by top-down decisions taking a ‘command and control’ approach.

Increasingly, Western democratic states, under pressure from civil society, have attempted to decentralize resource governance and management, to take a more integrated approach, to involve all affected stakeholders in decision making and to recognize that perfect knowledge of a situation is impossible, so there is less belief in the command and control of nature and more in pursuing best practices within the parameters of the best knowledge available.

However, powerful alliances of social forces acting in states around the world — multinational corporations, central governments — continue with centralized, sectoral, top-down, command and control approaches. Why? Because they enable massive wealth creation for the few through resource extraction. Two books that interrogate this phenomenon are shown here. Auto and Furlonge discuss ‘the rent curse’. Where a state’s economic wealth derives from few sources — think of oil producing states such as Venezuela, Nigeria, Angola, Sudan, Saudi Arabia — and extraction is readily centrally controlled, requiring very little input from the rest of society, central governments have a tendency to align their interests with the multinational company that enables, through technical and financial means, resource extraction. In return, the central state negotiates royalties from the sale of the resource — copper, gold, uranium, diamonds, oil, lithium — which is a sort of ‘rent’. They are in effect charging the extractive company a rent for operating in ‘their’ country. Not needing the citizens for anything, there is an unhealthy and unbalanced relationship between the dominant social forces in such a state: rather than attending to the needs of citizens, the state attends to the needs of the corporation and of itself.

This often results in a ‘resource curse’, discussed in relation to the Persian Gulf, by Kamrava and colleagues in the other book depicted on this slide. Why a curse? Because global demand for these resources enables the continuance of this relationship and encourages the emergence of black markets and so-called ‘shadow states’ to operate at the margins of society, far from population centres, in the equatorial rainforests, in the high mountains and desert environments where resources are to be found.

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Here we have depicted the interrelationship among the dominant social actors within states and in the world today: the sovereign state, the private sector, and civil society.

The world around us is a socially constructed world. Humans through their ingenuity and determination have brought this world into being. It is the sum total of all of our efforts. It is nothing like almost anyone ever could have imagined. As Marx said,

“Men [sic] make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past.”

Similarly, our institutions reflect the past, they do not anticipate the future; short of revolution we are always engaged in reform, revision, rethinking. So, here we are, prisoners of the past, inhabitants of the present, always trying to prefigure the future. Development, broadly defined, results from the interaction of dominant social forces. What is a social force? It is an entity with the capacity to exercise power in support of its interests. What sort of entity, you may ask? There are many, but generally we can group them in three categories: states (.gov), civil society (.org), and the private sector (.com).

How do these dominant actors exercise power in this world? Power is often defined as the capacity to get someone to do something that they would not otherwise do on their own. Perhaps this is a useful definition – at least as a starting point. But power itself is, in the words of my old mentor and professor, James George Eayrs, evanescent. Meaning that it is not easy to get a handle on. Former Soviet leader Joseph Stalin once remarked sarcastically, ‘How many divisions has the Pope?’ In other words, in comparison to Soviet military power, the Catholic Church in Comrade Joe’s eyes was ‘powerless’. Stalin was referring to ‘power over’, the capacity to compel usually through force some sort of action. Yet, long after not only Stalin, but the USSR itself came to an end, the Church is still with us in the world. So, how to think of power? Robert W. Cox encourages us to think of power in three forms: ideational, institutional and material.

Ideas are powerful. They can compel multitudes to act in a particular way. New ideas can change the course of history. But an idea is just an idea until it manifests in some sort of behaviour. Much of global political economy revolves around contested explanations of why things are the way they are and what should be done about it. Martha Finnemore and Kathryn Sikkink, in a highly cited 1998 article, speak of ‘norm entrepreneurs’, i.e. those actors who seek to establish their ideas as accepted forms of social thinking and practice, i.e. to have ideas accepted in such a way that they become social norms, i.e. the accepted way of doing things. ‘Sustainable development’, ‘equality’, ‘justice’, ‘the market’, ‘the rights of nature’ — these are all powerful ideas at play in the world today.

Power also manifests in institutions. Stalin was wrong: the Church is a powerful institution. Institutions grow up around ideas. The Catholic Church is an institution. The legal system is an institution. The sovereign state exercises its power through its institutions – government, legal systems (judiciary, police) – which is supplemented by material forms of power – military, capital (through production and taxation).

Individuals, groups, and companies also wield different forms of ideational, material and institutional power. Capitalism as an embedded norm is a form of ideational power whose ‘rules’ and ‘regularities’ empower some materially while disempowering many others. The World Bank and IMF are sometimes called the ‘world’s police’ as they ensure states play by the rules of the capitalist world system. Together this amalgam of ideational, institutional and material power comes together in a sort of ‘order’. If nothing else, this order may take some loose form that is widely accepted as fact. Today’s world order is a neoliberal capitalist world order. But there is no unanimity about either its form or its legitimacy. It is highly contested in many ways: from black markets to ISIS, there are many who do not accept the current world order as the desired one. The current U.S. president is determined to unmake this order, and to fashion a different set of social relationships founded on ‘might makes right’ in support of ‘making America great again’. Part of his agenda is to shift norms and practices related to natural resources: deny climate change, undermine regulatory regimes, separate from global governance organizations.

By focusing on the state, the private sector, civil society and their interrelationships we can begin to identify the primary forces shaping our world today. If the three are in relative alignment, then life is good! If one (the state) or two (the state and private sector) collude and largely exclude or ignore the third (civil society), then we see a variety of pathological behaviours typical of ‘bad states’ practicing ‘bad governance’.

Within states, the roles are not clear cut. As citizens, we occupy different positions sometimes simultaneously and sometimes across time and space: we are members of civil society organizations but also have a small business. We leave the private sector to take a position in government. And, since we are all citizens of the same sovereign state, in theory at least we are all on the same side pulling for the same outcomes. The triangle allows us to theorize about the political economy of development, of sustainability, of resource access, use and management. Like all models, or heuristic devices, it is not perfect but helps us in an important way.

Here are some useful supplements regarding civil society discussed in this slide:

<https://www.weforum.org/agenda/2018/04/what-is-civil-society/>

<https://www.weforum.org/agenda/2017/12/5-challenges-facing-civil-society-in-the-fourth-industrial-revolution>

<https://www.weforum.org/agenda/2018/04/civil-society-must-adapt-to-survive-its-greatest-challenges>

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If we think of our triangle of the interrelationships of dominant actors – states, civil society, the private sector – we can think of these as together constituting the social relations of production. What this means is that humans have needs (e.g. food, shelter, clothing, healthcare, security) and, as a collective, we can provide these needs. These needs require a form of production: industry, agriculture, trade, services and so on. The geographical setting provides the opportunity to engage in forms of production. The success of productive forces requires satisfactory social arrangements. Over time, these social arrangements settle into a particular pattern. We call this pattern the social relations of production. A principle we accept in this course is that for sustainable development to take place, there must be relative balance among the dominant actors. In other words, the social relations of production must not privilege one group's needs/interests while discriminating against those of another group's needs/interests.

The dominant actors have different core Interests: the private sector Is Interested In profit; civil society is interested in maintaining space to pursue its interests (of which there are many); and the state is interested in maintaining itself and (in theory) providing the setting in which the other two (private sector and civil society) can flourish. In 'developed' states there is a relative balance among the three. Indicators such as the Human Development Index (HDI) and Gini Index of income inequality help us see the broad picture. In 'underdeveloped' states there is a clear and identifiable imbalance among the three. In a world system, this triangle would also be three dimensional, with other states, civil societies and private sector actors influencing each other around the world.

In order to understand (im)balance, we turn to the constellation of social forces. Not all states are the same and one state is not the same today as it was twenty years ago. Things change. Fifty years ago the state dominated development policy and practice. Today, states establish broad parameters, but the primary force in development today is the private sector, in particular finance capital and the transnational corporation. Civil society is much stronger today than it was twenty years ago, but not everywhere. Many states have governments who actively oppress civil society, restricting people's ability to organize in their own interest.

The constellation of social forces concept was developed by Robert W. Cox as a way to understand power relations within and between states. Who sits at the centre of power? Who is relegated to the margins of society? In the image we see that those wielding political and economic power (institutional and material) 'call the shots' and 'set the agenda'. They may derive some of their influence from the dominant ideas of the day. What allowed corporations to become so dominant in the world today? To move into position 1, ahead of most states in the

world? It was the idea that the state should back out of the way and let market forces dictate development outcomes. What allowed finance capital to become so overwhelmingly dominant in the global political economy today? To be able to circumscribe state action through bond rating agencies? To determine development policy through loan agreements? To raise up and crush down economies with ‘hot money’? It was the idea that capital controls should be eliminated and that money should be free to roam in search of the best return on investment anywhere in the world. These are not universal truths, but ideas. There are many ways to organize societies as any cursory look at history will reveal to you.

This constellation of social forces – those at the heart of political and economic power, those who derive benefits from the arrangements of power, and those who are most harmed by and who least benefit from these arrangements – is ever changing. Canada today is not the same Canada that existed in 1975. Why not? Because the social forces have shifted, pushing some actors out and bringing some in. It is important for us in the political economy of development to understand how power is organized. In that way, we will be better empowered ourselves to understand how to effect the changes we desire in the world today, and to understand why some of our efforts fail while others succeed.

We can relate the interrelationship of dominant actors (slide 7) to the constellation of social forces (slide 8) when considering natural resources access use and management. Extractive industries are constituted by powerful usually multinational companies. [Teck Minerals](#), for example, which operates out of Vancouver, not only mines copper in Canada but around the world. Recently, Teck merged with global mining giant, Anglo American to create Anglo Teck. BC Premier David Eby said the merger is [“Great news for B.C.”](#) Arguing that the merger will mean jobs and wealth creation for Canada, the Federal Government approved the merger. There are more than 20 mining companies operating across Canada’s North, mining everything from diamonds to gold to rare earth minerals. And of course there are the tar sands. Located in ‘remote’ areas with low levels of population, there is little civil society action either in support or opposed to these operations. And where there is, for example in relation to negative consequences to local livelihoods in Fort Chipewyan from hydroelectric dams downstream, the capacity of communities to rebalance the state-private sector relationship is nearly impossible. The NFB documentary [Footprints in the Delta](#) gives a great insight into this challenge.

As shown in Slide 8, the location of extraction is physically remote from the location of decision. How to ensure socio-ecological balance from these enterprises? What steps would you take to ensure the best decisions are made in support of the wants, needs and interests of the local people and the environment?

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Here I have attempted to articulate concisely the difference between ‘government’ and ‘governance’, differentiating them across seven categories — nature, authority, structure, actors, scale, tools, and legitimacy. Take a few minutes to study their differences.

DIMENSION	GOVERNMENT	GOVERNANCE
NATURE	Institution	Process/system
AUTHORITY	Formal, legal, state-based	Formal PLUS informal, state and non-state
STRUCTURE	Hierarchical	Networked, polycentric
ACTORS	State officials	State, market, civil society, communities
SCALE	Primarily national/subnational	Local to global
TOOLS	Laws, regulations, coercion	Rules, norms, incentives, partnerships
LEGITIMACY	Legal-constitutional	Legal, social, moral, performance-based

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For our purposes, it is important to understand that governance is both an outcome and an ongoing process, involving a variety of legitimate and authoritative actors. It is also essential for us to understand that good governance can never reach an end point. As a process it depends on the reiteration of activities that deepen trust.

As an outcome it reflects settled social relations. If it is good, it suggests widespread – if not universal – social approval of its practices. It is most readily constituted and observable at a local level, so raising questions about the fungibility of effective local governance, in particular the ways and means of moving from one socio-geopolitical scale to another.

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What, then, constitutes “good governance”? For governance to be good it must perform across four interrelated dimensions. Here I illustrate this by using Tropp’s 2005 diagram of water governance: the environmental dimension results in sustainable use; the social dimension in equitable use; the economic dimension in efficient use — meaning not wasting limited resources, but maximizing their contribution to socially-determined ends; and the political dimension

strives to achieve equitable, just and fair access and use of the resource. Clearly these are ideals. How to achieve them?

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Whereas Tropp sketches out governance across four dimensions with four separate but interrelated outcomes, the UN (2003), as illustrated here, sets out ten benchmarks of effective governance performance:

- Participation
- Transparency
- Equity
- Effectiveness and Efficiency
- Rule of Law
- Accountability
- Coherency
- Responsiveness
- Integration
- Ethical considerations

While there is some overlap with Tropp's four dimensions, another overlap concerns the question I just asked: while these are perhaps the things we wish to achieve in governance, how do we achieve them? What specific steps must be taken?

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As we aim to move beyond 'command and control' systems of governance and management, it is important to keep Bruce Mitchell's words in mind regarding humans' ability to 'control nature':

'[I]t is often presumptuous to believe that humans "manage" environment and resources. More realistically, **humans manage their interactions with environment and resources**. For that reason, uncertainty (as a result of imperfect understanding), as well as ignorance, and conflict (as a result of many different and legitimate interests) are common. Furthermore, the complexity of biophysical and socio-economic systems is great, and is exacerbated by ongoing change, some of which is influenced or caused by human activity. Thus, to develop policies, programmes or plans for resource and environmental management, or to be able to appraise the effectiveness of initiatives, it is important to be able to recognize and deal with change, complexity, uncertainty and conflict.'

— Bruce Mitchell, 2002, Resource and Environmental Management, p. 346.

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There is a tension at the heart of what we as humans are trying to do (impose order) within the dynamic, ever-changing system that is the natural world. Ecosystems are dynamic and change is

natural, including cataclysmic change. Humans, in order to flourish, require order and predictability.

The idea that humans (i.e. “Man”) could impose order on the natural world is a consequence of first the Enlightenment era in Europe followed by the industrial age. Keith Thomas’s *Man and the Natural World* explores this relationship in England between 1500-1800. Thomas describes how the idea that “Man” is a rational being unlike other beings, capable of controlling his environment through the application of technology and the use of scientific reasoning and not subject to fate. Such a shift in thinking enabled the perceptual shift away from humans being part of nature to being apart from it.

Such thinking enabled Western European men to eventually justify not only their domination of ‘nature’, but of those beings — i.e. women and people of other races — regarded as being ‘closer to nature’ than themselves. The results of such thinking, particularly as new technologies emerged through industrial development, are everywhere to be seen today.

Given that action leads to reaction, often in unexpected ways, attempts to dominate nature and other people often resulted in a variety of unintended consequences. “Management”, therefore, is characterized by an endless series of adjustments as systems changed and humans continued to search for the ways and means of command and control.

From a socio-ecological systems perspective, if we wish to remain within a particular system, we must recognize boundaries and acknowledge limits. Going beyond boundaries (a known order) will create a new system (an unknown or less well-known disorder). Adaptation will be necessary. If we are indeed moving from the Holocene to Anthropocene, dramatic changes will be required in existing forms of governance and management.

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But how to incite the shift from command and control to flexibility and adaptation? Asking people to change is very difficult, especially when current practices yield a wide variety of immediate livelihood-related benefits for millions of people. In the winter here in Sackville it gets very cold. Who would forsake their immediate comfort from fossil-fuel heat in the hope that everyone else does too? How do we make a convincing argument at the level of society? Especially given the way the constellation of social forces are arranged around carbon-based political, economic and social power?

My argument is that we must lay a foundation of knowledge in science. By ‘science’, I mean an informed understanding of the principal processes that maintain the planetary life support system. And by ‘knowledge in science’, I am including both Western science and Indigenous systems of knowing and understanding. This collaborative way of understanding, is what Mi’kmaq elder Albert Marshall calls ‘two-eyed seeing’: we need both Western science and Indigenous knowledge in order to see completely and understand more deeply.

A good place to start is with the Laws of Thermodynamics. **Laws of thermodynamics** describe the energy flow in an Ecosystem:

- 1st Law (**Law of Conservation of Energy**): Energy can not be created or destroyed; it is merely changed from one form into another
- 2nd Law (**Law of Entropy**): When energy is transformed from one form into another, there is always a decrease in the quality of usable energy.

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Here we see why both laws matter for managing natural resources. The first law tells us that ‘nothing disappears’ and so we need to remember that waste (of all kinds), pollution (point-source and diffuse) and emissions are unavoidable!

The second law tells us that ‘everything degrades’ and so we need to remember that resource use efficiency, resource conservation, and prevention of use matter more than after-the-fact cleanup.

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In the context of ‘nothing disappears’ and ‘everything degrades’, we also need to consider the pace and intensity of activity. Over much of the Holocene era there was a relatively stable climate where energy flows were dominated by solar input and biological processes. Human systems were largely embedded within ecosystem limits, though there were pockets of cataclysmic change such as deforestation in Easter Island, and, with technological change, the displacement of people and cultures through Western colonial/imperial so-called ‘voyages of discovery’.

But the shift to the so-called Anthropocene (from the mid-20th C onward) has led to a rapid, large-scale human redirection of energy and materials, primarily as we have unlocked ancient stored energy and introduced into the present day. Human systems have clearly begun to override natural regulatory processes and we need to think of these in terms of energy flows.

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In thinking about energy flows and how the high-modern world functions in relations to the first two laws of thermodynamics, as socio-ecological systems approach supporters we aim for:

- **Sustainability** which is not about stopping resource use—it’s about **slowing down irreversible degradation**.
- **Conservation** where conserving resources saves **high-quality energy and materials** for future use.
- **Circular economy** approaches (as opposed to take-make-waste linear models), but remember while they help — thermodynamics tells us they **can never be perfectly circular, so there are limits** — so they will never be a panacea, a one-off solution.
- **Preserving and promoting ecosystem services** which are **energy-processing systems**—once degraded, they require large energy inputs to restore (if restoration is even possible)

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Here are two rendering of the world’s major biomes. As you can see, there are six: tundra, taiga, grassland, desert, temperate forest and tropical rain forest. In the image on the left, you can see how these six biomes extend around the entire world. Think of where we are today in New Brunswick. Many of you come from other parts of the world. When we say ‘city’ or ‘village’ or

‘farm’ or ‘factory’ we think of something that exists around the world. But think of the particular ecological context for these cities and the sorts of challenges that are created by building human settlements in different biomes.

The image on the right usefully maps out these biomes in relation to average annual precipitation (in centimetres) on the Y axis and average annual temperature (in celsius) on the X axis. Once again, think of the various challenges that confront humans who choose to settle in Fort McMurray, located in the heart of a boreal forest, and those who settle in Delhi, located in a semi-arid savanna zone (which would include grassland and temperate forest mix in the image on the left, and in the middle part of the tropical seasonal forest/savanna category on the right). These are completely different biomes yet host to large populations of humans.

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While it is important to think at all scales when considering NRM challenges, it is generally most useful to scale down — to ecozones, ecoregions, and ultimately ecosystems — for functional planning and management purposes. Ecozones are an important construct for resource management. An ecozone is an area of Earth's surface representing large, very generalized ecological units. Each ecozone is characterized by a unique interplay of geologic, climatic, vegetative, wildlife and human activity factors. Canada has 20 ecozones: 15 terrestrial and five marine. The 15 terrestrial ecozones are further divided into 53 ecoprovinces and those in turn are subdivided into 194 ecoregions. Ecozones, ecoprovinces and ecoregions are useful units for reporting and planning purposes at, respectively, the national, provincial and regional levels.

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If we were to take an ecosystem-based management approach, what would that mean? For me, and for many others, it means holistic management that takes into account the entire ecosystem and emphasizes biodiversity and ecosystem integrity, as opposed to focusing primarily or solely on a resource or resources, such as water or timber, within an ecosystem.

If we remove the tree(s), if we divert the water, if we trap the wolves, what happens to this environment? Is it able to sustain itself? Do we care? Or do we just move on?

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CLASS 8

Slide 47

Last day we left off defining an ecosystem:

- A community of organisms occupying a given region within a biome, including the physical and chemical environment of that community and all the interactions among and between organisms and their environment

And today I want to draw on the World Resources 2000-01 report to provide us with some details about ecosystem characteristics, the pressures they face, and the impact, real and

potential, of the different management styles — traditional, command and control versus socio-ecological systems thinking informed ecosystems approaches.

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We can draw inspiration for pressing for an ecosystems approach from these astute observation from World Resources report (2000-01, p. 8)

- Ecosystems sustain us. They are Earth's primary producers, solar-powered factories that yield the most basic necessities – food, fiber, water.
- Ecosystems also provide essential services – air and water purification, climate control, nutrient cycling, and soil production – services we can't replace at any reasonable price.

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In the report, they discuss five predominant ecosystems: agroecosystems, coastal ecosystems, forest ecosystems, freshwater ecosystems and grassland ecosystems. Each of these ecosystems provides humans with both goods and services.

Agroecosystems provide goods such as food crops, fiber crops and crop genetic resources. They provide a wide variety of services too: maintain limited watershed functions (infiltration, flow control, partial soil protection); provide habitat for birds, pollinators, soil organisms important to agriculture; build soil organic matter; sequester atmospheric carbon; and provide employment.

Coastal ecosystems provide goods such as fish and shellfish; fishmeal (animal feed); seaweeds (for food and industrial use); salt; and genetic resources. In terms of services, they moderate storm impacts (mangroves; barrier islands); provide wildlife (marine and terrestrial) habitat; maintain biodiversity; dilute and treat wastes; provide harbours and transportation routes; provide human habitat; provide employment; and provide for aesthetic enjoyment and recreation.

Forest ecosystems provide a wide range of goods: timber, fuelwood, drinking and irrigation water, fodder, non-timber products (vines, bamboos, leaves, etc), and food (honey, mushrooms, fruit, and other edible plants and animals). In terms of ecosystem services, forest ecosystems remove air pollutants, emit oxygen; cycle nutrients; maintain an array of watershed functions (infiltration, purification, flow control, soil stabilization); maintain biodiversity; sequester atmospheric carbon; moderate weather extremes and impacts; generate soil; provide employment; provide human and wildlife habitat; and provide for aesthetic enjoyment and recreation.

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Freshwater and Grassland ecosystems are similarly spectacular in terms of the goods and services they provide to humans. Freshwater systems help provide goods as varied as drinking and irrigation water, fish, hydroelectricity and genetic resources. In terms of ecosystem services, they buffer water flow (control timing and volume), dilute and carry away wastes, cycle nutrients, maintain biodiversity, provide aquatic habitat, provide transportation corridor, provide employment and provide for aesthetic enjoyment and recreation.

Grassland ecosystems provide goods such as livestock (food, game, hides, fiber), drinking and irrigation water and genetic resources. And they provide ecosystem services such as: maintain

array of watershed functions, cycle nutrients, remove air pollutants, emit oxygen, maintain biodiversity, generate soil, sequester atmospheric carbon, provide human and wildlife habitat, provide employment and provide aesthetic enjoyment and recreation.

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Despite this wide array of important services, all ecosystems are being significantly degraded. For example, in the 2000-01 report these facts were highlighted:

- 75% of major marine fish stocks either depleted from overfishing or are being fished to their biological limit.
- Logging and conversion have shrunk the world's forest cover by as much as half, and roads, farms and residences are rapidly fragmenting what remains into smaller forest islands.
- 58% of coral reefs are potentially threatened by destructive fishing practices, tourist pressures and pollution
- 65% of the roughly 1.5 billion ha of cropland worldwide have experienced some degree of soil degradation.
- Overpumping of groundwater by the world's farmers exceeds natural recharge rates by at least 160 billion m³/year

These are only a few examples, but you get the point — a point we have been making for four weeks now!

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Of course the principal source of ecosystem degradation is us!

- Overuse
- Conversion
- Invasive species
- Pollution
- Climate change

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Let's look at the primary human induced pressures on ecosystems.

Agro ecosystems face pressures such as conversion of farmland to urban and industrial uses; water pollution from nutrient runoff and siltation; water scarcity from irrigation; degradation of soil from erosion, shifting cultivation, or nutrient depletion; and changing weather patterns. In terms of causes we see population growth, increasing demand for food and industrial goods, urbanization, government policies subsidizing agricultural inputs and irrigation, poverty and insecure tenure, as well as climate change.

Coastal ecosystems face pressures such as over exploitation of fisheries, conversion of wetlands and coastal habitats, water pollution from agricultural and industrial sources, fragmentation or destruction of natural title barriers and reefs, invasion of non-native species, and potential sea level rise. In terms of causes we see many similarities with agro ecosystems such as population growth increase demand urbanization government subsidy's in addition to inadequate information about ecosystem conditions, especially for fisheries, poverty and insecure tenure, uncoordinated coastal land use policies, and of course climate change.

Forest ecosystems face pressures such as conversion or fragmentation resulting from agricultural or urban uses; deforestation resulting in loss of biodiversity, release of stored carbon, air and water pollution; acid rain from industrial pollution; invasion of non-native species; and over extraction of water for agricultural, urban, and industrial uses. Causes of pressures are similar to the other ecosystems: population growth, increase demand, government subsidies, inadequate valuation of costs of industrial air pollution, poverty and insecure tenure.

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Freshwater ecosystems face pressures such as over extraction of water for agricultural, urban, and industrial uses; overexploitation of inland fisheries; building dams for irrigation, hydropower, and flood control; water pollution from agricultural, urban, and industrial uses; and invasion of alien species. Causes are exactly the same as the other ecosystems as you see in the slide.

Grassland ecosystems face pressures from conversion or fragmentation owing to agricultural or urban uses; induced grassland fires resulting in loss of biodiversity, release of stored carbon, and air pollution; soil degradation and water pollution from livestock herds; as well as over exploitation of game animals. As with the other ecosystems the pressures are much the same.

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Adopting an ecosystem approach is no easy task. A first step is adopting, ourselves, an ecosystem sensibility: thinking holistically, thinking in terms of connections not separations. An ecosystem approach broadly evaluates how people's use of an ecosystem affects its functioning and productivity. More specifically, an ecosystem approach:

- is an integrated approach
- reorients the boundaries that traditional have defined our management of ecosystems
- takes the long view
- includes people, and
- maintains the productive potential of ecosystems

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This brings us back to the need to shift from command and control traditional forms of management toward ecosystem approaches based on a social ecological systems sensibility. Let's take forest management for example. In traditional force management, the primary objectives are to maximize commodity production, maximize net present value, and to maintain harvest or use of forest products at levels less than or equal to their growth or renewal. Traditional forest management works at the stand level within political or ownership boundaries. It views the role of science as an applied sort of service in support of how to get the most economic return on investment. Therefore, the role of management in this case focuses on outputs that is goods and services demanded by people such as timber, recreation, wildlife, and forage. It strives for management that fits industrial production. And it considers timber to be the most important forest output, so-called timber primacy. As such it strives to avoid impending timber famine and views forests as a crop production system.

In contrast, forest ecosystem management has a different set of objectives. It aims to maintain the forest ecosystem as an interconnected whole, while allowing for sustainable commodity

production. It maintains future options. And it aims to sustain ecosystem productivity overtime, with short term consideration of factors such as forest aesthetics and the social acceptability of harvest practices. In terms of scale, unlike the traditional forest management system which operates at stand level an ecosystem approach works at the ecosystem and landscape level. Here , the role of science combines western science social factors as well as other ways of knowing such as Indigenous knowledge, as well as traditional ecological knowledge.

The role of management focuses on inputs and processes such as soil, biological diversity, and ecological processes, since these give rise to goods and services. It strives for management that mimics natural processes and productivity. It considers all species -- plant and animal -- Important and considers services (Protecting watersheds, recreation, etc) are on equal footing with goods such as timber. It strives to avoid biodiversity loss and soil degradation, and it views forests as a natural system, i.e. more than the sum of its parts.