BUFFER ZONE CONSIDERATIONS

FOR MINING DEVELOPMENT

IN PROXIMITY TO HUMAN POPULATIONS

Prepared For:

MiningWatch Canada
Ottawa, Ontario
Canada

July 2016

Prepared By:

CCSG Associates

Box 34026
Whitehorse, Yukon
Canada
Y1A 7A3

Table of Contents

BUFFER ZONE CONSIDERATIONS

TO PROTECT HUMAN HEALTH

IN PROXIMITY TO MINING DEVELOPMENT

1.0 Summary Report on Buffer Zones

CCSG Associates has compiled a brief overview for consideration in determining appropriate buffer zones to protect human health and well being for populations in proximity to mine development. This summary of existing regulations and relevant research provides a cursory perspective. Consideration of mining development, that impacts communities, families, and individuals, is both general in principles and also site specific.

This report outlines aspects that are necessary in determining buffer zone delineations for mining development that can protect human health, well being and quality of life.

2.0 Population

The population to be affected and considered in a buffer zone analysis to protect health, safety and well being is diverse. There are many uses of an area, such as housing, community, workplace, school, recreational, cultural, agriculture, wild harvest, or gardens. The exposure to communities in proximity to development can be affected on physical, social and spiritual levels – from childhood through generations.

Buffer zones are intended to provide protection of health in core functions, and provide transition towards increasing disturbance of development.

Social health is determined by the economic and social conditions that shape the health of individuals, communities, and jurisdictions as a whole {{658 Raphael,D. 2008}}. The extent to which a person possesses the physical, social, and personal resources to identify and achieve personal aspirations, satisfy needs, and cope with their environment is dependent on social health {{658 Raphael,D. 2008}}.

When there is mining development that impacts a community, there are multi-generational effects. A child who is exposed to a contaminant (noise, pollutants, disruption of environment etc) affects their individual health and well being. The sphere of influence in relationships with others is then impacted through their transactions. These physical and social health effects are then compounded through the expanding interactions among affected individuals within their family, with peers, at school, and in work. These health effects can exist on a community wide basis through successive generations.

Buffer zones are needed to be considered in a long term way that protects human health and well being. Appropriate consultation (discussed more in quality of life section) on through the decision making process for development to occur can accomplish a building of consensus through collaboration. This requires time and resources to strengthen relationships and bridge the divide of differing opinions.

3.0 Noise

There are many different types of noise associated with living in close proximity to mining development. There can be short abrupt sounds of blasting, regular truck movements, crushing grinding or processing practices part of daily mining. Each impacts the community differently, however, many health effects may occur such as cardiovascular disease, hearing loss, sleep disturbance, stress and immune effects.

3.1 Sound Level

Most city bylaws limit truck activity (garbage collection etc) to hours between 10am to 8pm. These are regulated by proximity, characterization of sound type, duration and frequency of occurrence. The US Environmental Protection Agency and World Health organization recommend that for human residential exposure sound levels should not exceed 50-55 decibels between 7am to 10pm, and 40 decibels at night.

4.0 Exposure

Research in environmental health has typically described contaminant exposures and health outcomes in a model with exposure pathways in which individuals are biological targets and potential harms to physical health is assessed at the individual level. The terms for this scenario have long been in use: contaminant, bioaccumulation and biomagnification. Drexler (2003) describes contaminant exposures. A contaminant is *“any physical, chemical, biological, or radiological substance found in air, water, soil or biological matter that has a harmful effect on plants or animals; harmful or hazardous*

matter introduced into the environment. Bioaccumulation is *"the accumulation of chemicals in the tissue of organisms through any route, including respiration, ingestion, or direct contact with contaminated water, sediment, and pore water in the sediment*". Biomagnification is *"the result of the process of bioaccumulation and biotransfer by which tissue concentrations of chemicals in organisms at one trophic level exceed tissue concentrations in organisms at the next lower trophic level.*

A community in close proximity to mining development experiences this accumulation of impacts to health and well being from sounds, land destruction, air quality, water quality and societal change. Different natural land formations can provide natural buffers to some types of disturbances.

5.0 Quality of Life

The community needs to be fully informed and consulted on decisions about appropriate buffer zones that will protect their quality of life. This is based on the following key principles: (1) recognize the community as a unit of identity; (2) build on the strengths and resources of the community; (3) facilitate collaborative partnerships in all phases of the research; (4) integrate knowledge and action for mutual benefit of all partners; (5) promote a co-learning and empowering process that attends to social inequalities; (6) involve a cyclical and iterative process; (7) frame research in positive perspectives and integrated with ecosystem based understanding and (8) disseminate findings and knowledge gained to all partners (Israel et al., 2005).

Adherence to these principles is critical as well to responsible consultation practices with indigenous communities. LaVeaux and Christopher identify additional principles

which are specific to CBPR research with indigenous communities: (1) acknowledge historical experiences of the community with research that has not followed appropriate protocols; (2) recognize and respect tribal sovereignty; (3) recognize tribal and community membership as defined by the community (i.e. may include non-native or non-status individuals); (4) understand tribal diversity and the implications for research of different communities having their own customs; (5) plan for extended timelines to allow for appropriate process for community participation; (6) recognize gatekeepers; (7) prepare for leadership turnover; (8) interpret data within the cultural context and (9) use indigenous ways of knowing (Laveaux and Christopher, 2009). While detailed explication of these principles is beyond the scope of this report, these principles lay the groundwork for approaching consultation and definition of buffer zones.

5.1 Stress

Stress is response to any kind of demand or threat. A threatened person experiences heightened nervous system effects that release a flood of stress hormones, including adrenaline and cortisol, to rouse the body for emergency action. This has long term health effects that a buffer zone should try to reduce.

5.2 Lifestyle Factors and Aesthetics

The community consultation described above in discussion of quality of life critical to determining what factors are most important to community decision making and allowing development to proceed responsibly.

6.0 Monitoring

The ongoing process needs to ensure that the conditions of development remain consistent with the community experience of feeling the health and well being effects meant to be minimized by appropriate buffer zones. This could involve the following:

- Advisory team involved to ensure technical and strong community representation
- Human health impact assessment influence in design and outcomes with a feedback process
- Resources need to be sufficient and well allocated
- Supports for participation, training, capacity building, communication for accountability and informed participation
- Clear follow-up response chain

6.1 Quality Assurance

An evaluation planning process for buffer zones should be accomplished by examining the processes within the system:

inputs →processes →outputs → outcomes → impact

The analysis could use methods from the systems model, quality assurance tools and diagnostic tools. Both individual interviews and survey should be used to generate data, in conjunction with group meetings to gather ideas.

Systems Model

- Define the parameters and illustrates the sub-systems
- Understand origins of problems and the logical sequencing of each step
- Determine what should be happening and what is actually happening at each sub- system
- Determine which steps are the common error-prone steps in each sub-system
- Investigate whether there are any unnecessary or cloudy steps
- Analyze the correctness of the sequence
- Determine who is accountable for each step?

Quality Assurance Tools

- Diagnostic
- Quality Assessment
- Type of health organization, mission, culture, structure
- Resource availability
- Routine monitoring vs external audit
- Funder directed vs internal generation of funding projects
- Management
- Quality Improvement and quality control
- Reengineering vs process improvement
- Problem solving tools
- Project management tools.

Diagnostic tools

- Measurement based on standards
- Evidence based
- Validated tools and procedures
- Organizational assessment
- Program or service delivery assessments
- Managerial effectiveness

An evaluation report could be developed based on criteria for performance measures developed in the initial planning stage of assesment. The intersection of key priorities and performance measures in evaluation, quality assurance and developing a strategic plan for setting priority programs is important.

7.0 Industry Standards

The most information about buffer zones is from conservation biology intended to protect ecosystems, wildlife species, habitats and biodiversity. Key concepts are to

provide core areas of protection and buffer zones with transitional areas between human impacts and the natural environment. This provides conditions to plan for human activity to proceed as responsibly as possible.

7.1 Quarries

Quarries have similar concerns to community disruption by as they are frequently located in close proximity to populations. The degree and nature of effects caused by quarrying varies according to the type of quarry, the scale of operation, methods used to excavate aggregate, the geology of the area, the receiving environment and the surrounding land uses. The effects of quarries also vary by their nature (rock or sand) and whether they are in short- or long-term use, in continuous use or used irregularly or seasonally.

The Quarrying involves the excavation of rock, gravel or sand from the ground (including river beds and beaches). Rock-won aggregate is typically produced through drilling and blasting it from suitable rock deposits, and crushing and screening it to the desired size.

Gravels and sand are normally sourced from river beds (both current and old) and from beaches. Excavation typically involves machinery, without the need for blasting. Crushing of gravel is usually limited to larger gravels while screening is used to separate out smaller sizes for specific uses. Aggregate products requiring further refinement can often involve additional washing, crushing and screening processes.

The uses of rock aggregate range from road preparation and finishing (base and surface) to composite for concrete. Gravel and sand aggregates are similarly used for road and construction products but also have a range of specialty landscaping uses.

Effects are either on site, on neighbouring properties or completely off site, such as the transportation of aggregate. The environmental effects of quarrying primarily include:

- the disturbance of land and vegetation
- the disturbance of river beds or coastal marine areas
- dust
- vibration
- noise
- traffic
- visual effects
- impact on cultural and historic heritage values
- the discharge of contaminants into air, water, land and the coastal marine area.

The effects of quarrying need to be considered when developing appropriate objectives, policies and methods in plans to manage quarrying. Although the effects of quarrying can often be mitigated, they cannot always be avoided.

When establishing parameters around objectives, policies and methods to control the effects of quarrying, it is important to encourage effects to be internalised on site as much as possible. The need to internalise effects also applies to resource consents, where the onus is on applicants to demonstrate they have internalised the effects of their activities as far as is reasonably practicable (see s17 of the RMA and case law on

Winstone Aggregates Limited v Papakura District Council (A096/98)). Only where the internalisation of effects cannot be achieved, and protection is warranted, should off-site mitigation or reverse sensitivity measures be considered.

However, when buffer zones are required Buffers establish an area around existing quarries or activity zones that prevent activities sensitive to quarrying locating there. Case law provides clear guidance on the use of buffers and that they should only be considered where an activity has taken all reasonable steps to internalise adverse effects. This can involve a quarry purchasing surrounding land to provide a buffer zone. However, all reasonably practical mitigation measures intended to internalise the effects may still fail to stop those effects from being experienced outside the boundary of the property. Such effects could include traffic noise, dust, noise, vibration and visual effects.

The use of buffers will require the consideration of the significance of the operation and other matters outlined in assessing and providing appropriate access to aggregate resources, including the effects likely to be generated from quarrying and reasonable measures taken to internalise them.

In considering the use of a buffer zone councils must be satisfied the effects from the activity are internalised as far as is reasonable and consider the appropriate distance to mitigate the effects in question against the significance of the quarrying activity. Compliance with buffers means that effects are measured from the notional boundary of the buffer rather than the site. This can raise issues over access to private land to undertake monitoring of effects and compliance.

An example of this approach is in the Special Rules Section of the Tasman Resource Management Plan. The Plan identifies Quarry Areas by Residential Activity Restriction Areas. The combined effect of the rules for these two areas is to mitigate the effects of quarrying in two ways: by regulating quarry activities and by reducing incompatible land uses in the vicinity. In Quarry Areas, quarries are a discretionary activity provided they comply with a number of terms and conditions, whereas the construction of a new dwelling or a residential activity is non-complying. In the Residential Activity Restriction Area, a new residential dwelling is a restricted discretionary activity and must be set back 500 metres from a working quarry. The council also restricts its discretion to a number of conditions including the extent to which the dwelling may individually or cumulatively compromise the efficient use of a Quarry Area or an existing quarry. For example, rule 2.4.6(g) of the Waipa District Plan requires that new dwellings should not be constructed closer than 500 metres to a site used for mineral extraction or where a consent has been granted for mineral extraction.

This example from New Zealand is typical of Canadian and other international buffer zone standards for quarries.

7.2 Oil and Gas

Oil and gas development using hydraulic fracturing often occurs near communities causing noise disturbance, contaminant releases. Buffers need to be part of the upfront planning to avoid accidents and releases that happen during gas development. Recognizing this, regulators and governments are trying to put in place mechanisms that build in physical or temporal separation between the source of contamination and

the significant public resource that needs protection. These buffers provide additional opportunities for remediation efforts to be successful, when there has been a spill or release. They accomplish this by putting in place 'no drill' setbacks along watercourses and around water wells. With the developments in drilling technology that allow directional and horizontal drilling to much greater distances, the use of setbacks is now feasible in a way that was not thinkable when all drilling was simply vertical. Operators can and do move their drilling sites away from watercourses, residences, schools, etc. and still can reach the gas resource (Baizel, 2005).

Health effects from exposure include skin, eye and sensory organ, respiratory, gastrointestinal and liver, brain and nervous system, immune, kidney, cardiovascular and blood, cancer, mutagenic, endocrine disruption, other, and ecological effects (Colburn, 2010).

The Alberta Energy Regulator is bound to the Alberta Land Stewardship Act (Directive 065: Resources Applications for Oil and Gas Reservoirs, 2016), which states that conservation easements are necessary for the protection conservation and enhancement of the environment; natural scenic and aesthetic values; agriculture; open space; and recreation. These buffer zones are determined site specifically.

The State of Colorado has set back zones of defined as different categories of buffer zones, set back zones and mitigation zones for oil and gas operators to engage with community members who could be impacted. These are:

>1,000 feet – Do not require notification to a building unit

<1,000 feet – Buffer Zone Setback – Urban Mitigation Area

< 500 feet – Exception Zone Setback

350 feet – Designated Outside Activity Area setback

200 feet – Statewide safety setback

150 feet – Property line setback

7.3 Wind

Sarah Laurie interviewed over 80 people in Australia in 2000. She found that most of the people initially supported the wind turbines coming into their communities. The CEO of the National Health and Medical Research Council, Professor Warwick Anderson (2012), recommends to set regulation buffer zones for wind development for the wind developers and adopt a precautionary approach.

There is controversy about health effects of turbines, for example a 2010 NHMRC Rapid Review which states there is no evidence of direct pathological adverse health effects caused by wind turbines and deeming this as a good development for their area.

However, not all the health problems are resolved, and a number of previously healthy productive and still young members of society find themselves significantly disabled, through no fault of their own, as a result of their chronic exposure to operating wind turbines. Some worked on the wind turbines. Pierpont documented symptoms reported by individuals exposed to wind turbines, which include sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal (US National Institute of Health).

Danish Acousticians found that larger turbines emit more low frequency noise proportionately compared to smaller turbines, based on actual noise measurements, rather than models. The effects of this can be seen at wind developments where the turbines are larger such as Waterloo wind development in South Australia, where residents report the effects of the low frequency noise out to 10km in certain weather and wind conditions. Waterloo now has a total of 5 households who have left their homes semi-permanently, as they become too unwell when they are home if the turbines are operating and the wind is blowing from certain direction (Moller & Pedersen, 2011).

Some farmers are saying even if they move away, they get sick when they return to farm their land, which is consistent with what we know about the effects of ongoing exposure to low frequency noise, once someone is “sensitized”.

Wind turbines calculate distances use an assumed rotor diameter of 100 m & a total height of 150 m, based on a 2.5 MW turbine.

In general there is no set back buffer zones set to protect individuals who sign with an energy company to have wind turbines on their land. In Ontario, the setback for new projects is 550 m from non-participants. Older turbines are allowed to be closer than 550 m. Municipalities do not have jurisdiction.

Summary Of Wind Turbine Buffer Zones Compiled By Ontario Wind Resistance

CANADA		
2011/08/17	Halifax, Nova Scotia	1000m to habitable building
2011/07/13	Quebec Province	750m to residence or 2km to towns
2011/07/13	Saskatchewan	700m setback
UNITED STATES		
2011/08/17	Charlton, Massachusetts	2500ft base to dwelling or Building=553.2m (Health Board)
2011/08/15	Lenawee County, Michigan	2000ft+consent+ compensation for loss of value 609.6m
2011/08/11	Clayton Town Council, New York	1250ft from nonparticipating Property boundaries +property Value guarantees 318m
2011/07/23	Hillsdale County, Michigan	1mile buffer zone to homes= 1609m
2011/07/20	Douglas Twp., Illinois	2000ft setback to homes= 609.6m

2011/06/29	Libertyville, Illinois	35dBA night time max noise
2011/06/28	Umatilla County, Oregon	2miles to a rural home=3218m
2011/06/02	Wareham, Massachusetts	2800ft to closest residence=853m
2011/06/02	Clifton, Maine	4000ft from occupied structures
2007/08/28	Allegeny NY	2500 ft = 762m
May 2008	Lyme NY	4500 ft setback from rural villages 1371m
2009	Hartsville NY	Maximum 3dBA above background Sound and minimum 2460 ft from dwelling= 749,8m
2011/05/17	Perry NY	804.6m
2011/12/03	Iroquois County, Illinois	2000 ft from homes And other buildings
2011/04/27	Brewster, Cape Cod	10X blade diameter (100m blade= 1000m setback from residential zone
2011/04/24	Barnstable County, Massachusettes	10x rotor diameter to nearest receptor (100m diam=1000m setback)
2011/04/18	Riverside California	3000ft from residential area

		=914.4m
2010/09/15	San Diego California	8 x total turbine height to residences= 8 x 500ft= 4000ft = 1.2km
2012/01/03	Shepherd Flat Oregon	36dBA noise limit
2011/03/14	Claybanks Township Michigan	3000 ft from property line of Nearest non-participating receptor
2008/11/13	Union Township Wisconsin	38 dBC, 35 dBA, or 5 dBA over background ambient noise levels, whichever is less 2640 ft from residences=804.6m
2009	Frankstown Twnshp, Blair County, PA	762m
2007/10/10	Potter County PA	2900 ft= 883.9m
2008/06/20	Fayette County PA	6,000-foot (1.1 mile) setback 1769.9m
2011/03/06	State of Wisconsin	1800 ft from nearest property line Of non-participating receptor =548.6m
2011/04/19	Roanoke County Virginia	0.5mile=804.5m

Sept 15 2011	Virginia	10x rotor diameter =approx 2700ft =823m
Sept 30 2011	Rumford Maine	4000ft setback from property line =1219m
2010/06/26	Buckfield Maine	1 mile or 13 times the turbine height= 500ft x 13 = 6500 ft = 1.98 km
2009/03/28	Montville Maine	1 mile or 13 times the turbine height= 500ft x 13 = 6500 ft = 1.98 km
2011/10/03	North Carolina	Medical Officer of Health recommends 1500m
2011/11/01	Frankfort Maine	Daytime noise 45dBA at property Boundary, nightime 32dBA 1mile setback=1609m
2012/02/06	Antrim New Hampshire	6x turbine height from any occupied Building+ noise 5dBA above precon- struction 6x150m=950m
2011/11/05	Pittsfield Illinois	1500ft from property line= 457m from property line (not dwelling)
2011/11/25	Ashfield Mass	Advisory Board Recommendation 32.5dBA for abutting properties Setback 3400ft from nonparticipating

		=1036m
2011/12/29	Moscow Maine	1.5miles from any property line =2.4km
2011/11/18	Catarunk, Maine	1.5miles from any property line =2.4km
2008	Rock County Wisconsin	2640ft=804.6m
2011/11/11	Lafargeville New York	550ft from property line for every 100ft of turbine height 500ft turbine=2750ft setback =838m
AUSTRALIA		
2011/08/31	Victoria State Government Australia	Landowners within 2km have Right of VETO
2011/06/27	Victoria State Gov't Australia	2km from a house=2000m
2011/12/23	New South Wales, Australia	proposed 2km from existing homes Noise levels not to exceed 35dBA
EUROPE		

2004 – 12	France Specialist Scientific and Technical Information, University of Paris	3.1miles=4.9km
2005/07/18	Eskdalemuir Scotland Applied and Environmental Geophysics Keele University	6.2mile=10km
2006 – 06	UK Noise Association	1 to 1.5 mile setbacks= 1.6km to 2.4km
2006/03/14	French National Academy of Medecine	1.5 km
2007	National Research Council	0.5 mile=804.5m
2009/02/20	Denmark	4 x turbine height= 500ft x 4 = 2000ft= 609.6m

7.5 Mining

The buffer zones for mining are intended minimize impacts to human health and well being. These buffer zones are addressing blasting, contaminant releases, dust, traffic disturbance. There are a number of buffer zone requirements for mines that help minimize and prevent impacts on the environment, neighbouring properties and nearby infrastructure such as roads and buildings. The general practice is that operations have

to be at least 30 metres from property boundaries, infrastructure and environmentally-significant features such as watercourses.

Florida phosphate strip mining is known to cause severe landscape disruptions. The Environmental Protection Agency recognizes severe degradation central Florida watersheds. They are addressing the advantages of building buffer zones engineered structures to mitigate the toxic environmental impacts caused by producing phosphate based fertilizers.

The **Indian** Ministry of the Environment and Forest has changed their mining buffer zone regulations to 1 kilometer adjacent to wildlife preserve (2013). As a result, 22 mines will not be in compliance and shut down. The committee also recommended a 3 kilometer buffer in one specific location.

In **Queensland**, Australia, 2km buffer zones around towns of more than 1000 people, implemented by the Premier Bligh's government in 2012. This included a retrospective removal of populated mines from 285 mining permits.

In **Newfoundland and Labrador** buffer zones for mining include exploration, construction and development. Buffers from 15 to 150 metres must be left along bodies of water for both erosion protection and aesthetic reasons. The width of the buffer zone will depend on soil characteristics (clay rich soil is more susceptible to solifluction), the steepness of the slope leading to bodies of water and the type of road construction. A recommended formula for determining buffer zone width is:

12 metres + 1.5 metres x slope (%)

The following buffer zones must be maintained around protected water supply areas:

- Intake Pond/Lake -150 metres

- River Intake -150 metres for a distance of 1 kilometre upstream and100 metres downstream
- Main River Channel- 75 metres
- Main Tributaries/lakes/ponds -50 metres
- Other bodies of water -30 metres

In addition, no clearing activity is to occur within 800 metres of a bald eagle or osprey nest during the nesting season (May 15 to July 31) and 200 metres outside the nesting season. All hardwoods within 30 metres of a body of water occupied by a beaver are to be left standing. For known waterfowl staging areas, a minimum 30 metre buffer from the water's edge with at least 20 metres of forest will be established. These areas will be identified by the Canadian Wildlife Service.

See also quarry section in section 7.5 above.

8.0 Relocation Standards

When mining development is unable to create appropriate buffer zones to protect the health and well being of populations nearby because of the extent of their proposed extraction plan, communities may need to be relocated. In the section 5.0 above on quality of life, the process for community engagement and decision making described is critical here.

Forced (involuntary or unwanted) resettlement of local communities may have profound impacts on the livelihoods of community members. Conflicts with local communities can arise during all stages of the relocation process. Many conflicts and

dilemmas result from a lack of adequate engagement, management and planning before the project is to be launched. Often, community members are not adequately consulted or not consulted at all. According the World Resources Institute's report "Development Without Conflict", effects of project decisions on communities are life changing. Any of those decisions can have profound and long-term impacts on the lives, livelihoods, and development of those communities, both in a positive or negative way.

Extractive industries, particularly in emerging or developing countries, can be a source of national income. Where revenues are fairly distributed and reinvested in education and health infrastructure, they provide important avenues for the development of disadvantaged or poor communities. Development opportunities include the provision of infrastructure and employment for often disadvantaged and/or isolated communities.

Many companies in the extractive sector still fail to mitigate harm resulting from the adverse impacts of their operations on local communities. Affected communities, among them vulnerable indigenous groups, may oppose such projects from the very beginning if they fear negative impacts. Community protests may result in violent and sometimes fatal clashes with company security personnel, perhaps inadequately trained to prevent tension. Road blocks may prevent companies from entering the extractive site or bringing in equipment and pose risks to business continuity.

These negative outcomes and impacts often result from a lack of implementation of effective community engagement programs from the outset. The exploration permit issued by local authorities provides companies with the legal license to operate on community land, but not necessarily a "social license to operate".

In some instances, for example in the Philippines, obtaining the free, prior and informed consent of indigenous communities actually amounts to a legal prerequisite in order to obtain an exploration permit.

The World Resources Institute states that community engagement often falls short due to the "failure to understand local political and community dynamics, or a failure to fully engage all local stakeholders affected by a project."

9.0 Conclusion

The ramifications of considering human health affected by contaminants, noise impacts, disruption of personal space and overall environment, for defining development questions, prevention of impacts, decision making, environmental monitoring and health care are raised. A change in the current approach to assessing mine development plans that aims to assess health and being of populations in close proximity to mine development, to design community interventions safety like buffer zones, it should be accomplished appropriately with a full decision making process.