Air Impact Assessment in Myanmar Development Projects

Moh Moh Thant Zin
Environmental Consultant
M. Sc (Environmental Toxicology, Technology & Management), B.Pharm

Global Air Pollution

- **Urban outdoor air pollution - 1.3 million deaths worldwide annually by WHO.**

- **The global burden of disease from respiratory infections, heart disease, and lung cancer - reduced by controlling ambient air pollution.**

Air Pollution in Myanmar

- **Nowadays, in Myanmar, *new economic developments and investments are blooming* over time.**

- ***The energy sector - the most important sector in greenhouse gas* (GHGs) emission as GHGs are emitted from combustion of fuel and fugitive emission from fossil fuel production (Myanmar Initial National Communication under UNFCCC, 2012)**

- **Moreover, there is rapid influx of new developments like *oil and gas explorations along with pipeline constructions, gas engine and gas turbine projects* across the country.**

Baseline Ambient Air Monitoring in Myanmar

- **Ambient air parameters**

  - Particulates : TSPM, PM10, PM2.5

  - Gases : NO2, SO2, CO, VOC, O3, CH4, NH3

- **Meteorology : Temperature, Relative Humidity, Wind speed, Wind direction**
- **Atomic Radiation**

Baseline Ambient Air Monitoring in Myanmar

- **WHO, USEPA, IFC & other reliable reference**

(i) The sensor intakes – sitting criteria (approx. 3 meters above the ground level) – breathing zone (40 CFR 58 Appendix E - Probe Sitting Criteria for Ambient Air Quality Monitoring)

(ii) Location - within 2km radius around the proposed project site. (assumed as no significant air impact beyond it)

(iii)Sampling time and frequency - monitor 24hr continuously

State of Air Quality in Myanmar

Yangon : Baseline air monitoring (2012-2013)

Parameter	Average	WHO	NAAQS (USEPA)
TSPM 24-hr avg (range) µg/m^3	*220*	100	NA
PM10 24-hr avg (range) µg/m^3	*128*	50	150

Substance (µg/m^3)	(Average)	WHO Guideline	NAAQS (USEPA)	World Bank Guideline
NO_2 (ppb)	*39*	40[1]	100[2]	150[2]
SO_2(ppb)	*2*	20[2]	80[2]	125[2]
CO (ppb)	*0.4*	NA	NA	NA
VOC(ppb)	*non-detectable*	NA	NA	9 ppm (8hr)

Generally, fugitive dusts mostly emitted from mobile sources do not meet air quality guidelines

Mandalay : Baseline air monitoring (2007-2008)

Commercial area

Residential area

Industrial area

Mandalay : Baseline air monitoring (2007-2008)

Parameter	Commercial	Residential	Industrial	WHO	NAAQS (USEPA)
TSPM 24-hr avg (range) µg /m^3	495.87	213.08	350.57	100	NA
PM10 24-hr avg (range) µg /m^3	112.49	61.67	131.54	50	150

Substance (µg/m^3)	Commercial	Residential	Industrial	WHO Guideline	NAAQS (USEPA)	World Bank Guideline
NO_2 (ppb)	32.13	17.8	19.14	40[1]	100[2]	150[2]
SO_2(ppb)	0.86	0.98	1.5	20[2]	80[2]	125[2]

(MANDALAY REGION)
Nyaung Oo (Bagan)/ Kyaukpadayng

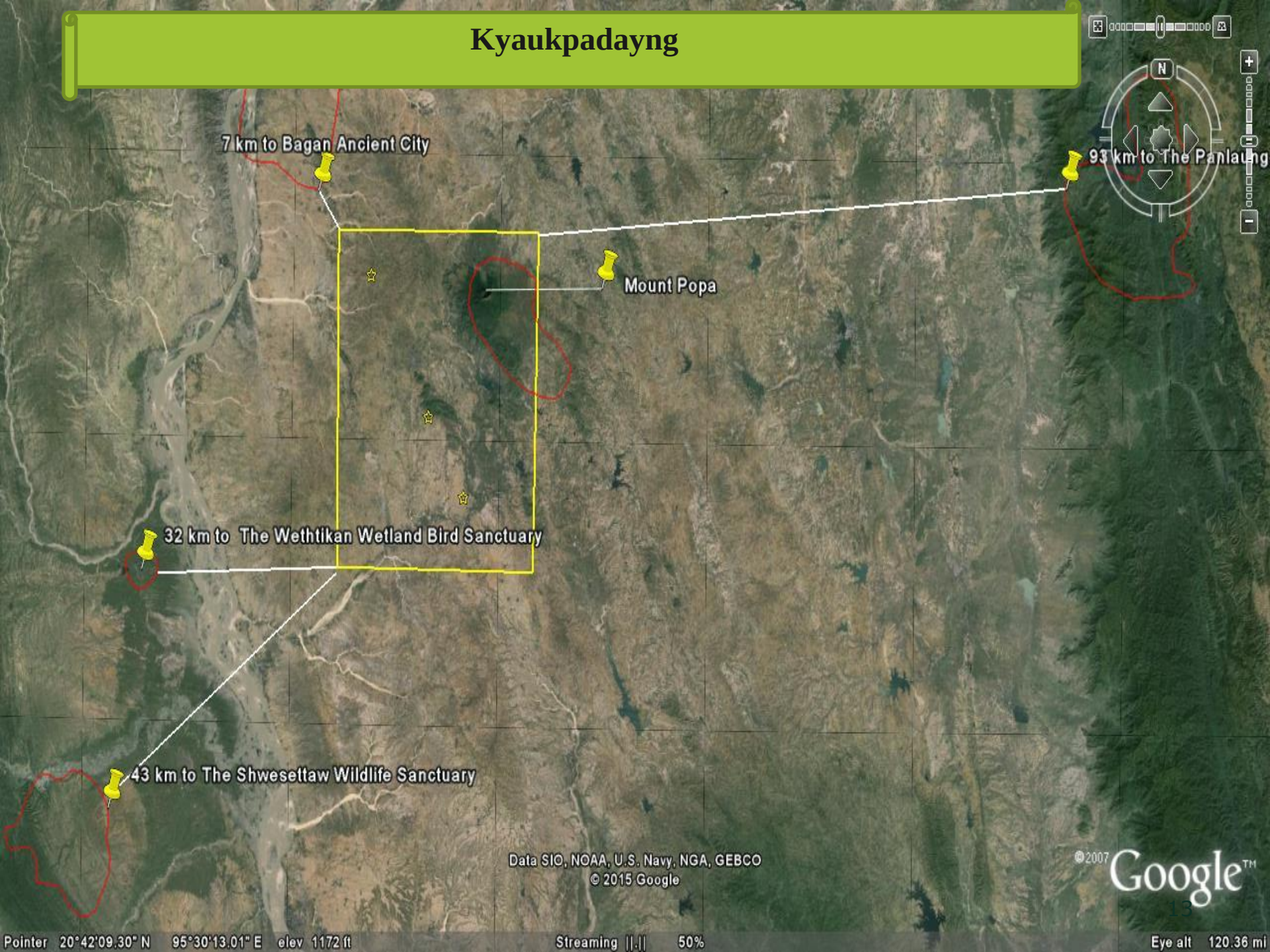
Nyaung Oo (Bagan)

Nyaung Oo (Bagan)

Parameter	Average	WHO	NAAQS (USEPA)
TSPM 24-hr avg (range) µg/m^3	258	100	NA
PM10 24-hr avg (range) µg/m^3	91	50	150

Substance (µg/m^3)	Average	WHO Guideline	NAAQS (USEPA)	World Bank Guideline
NO_2 (ppb)	45	40[1]	100[2]	150[2]
SO_2(ppb)	2	20[2]	80[2]	125[2]
CO (ppb)	0.3	NA	NA	NA
VOC(ppb)	0.02	NA	NA	9 ppm (8hr)

Kyaukpadayng



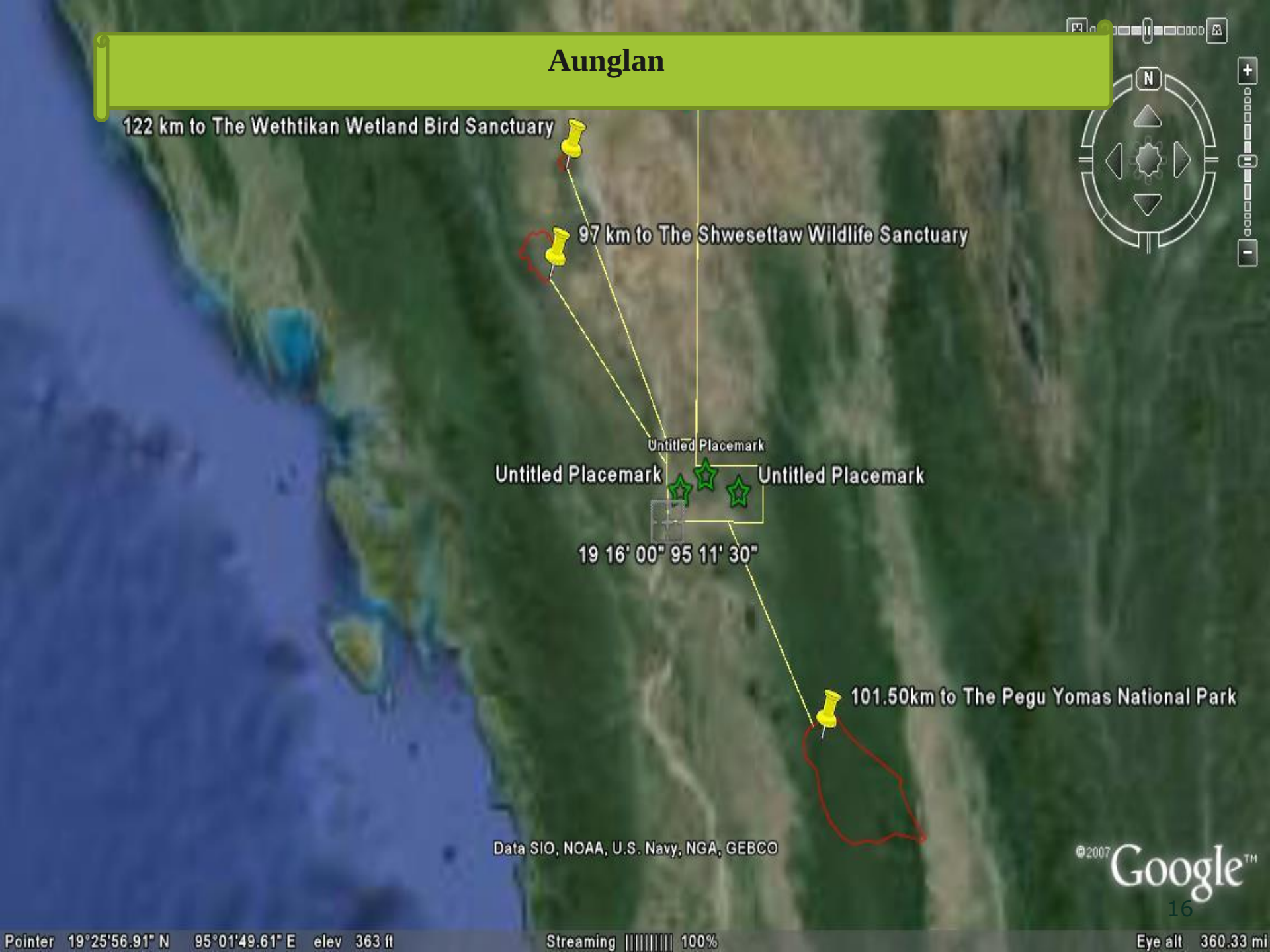
Kyaukpadayng

Parameter	Average	WHO	NAAQS (USEPA)
TSPM 24-hr avg (range) µg/m^3	276	100	NA
PM10 24-hr avg (range) µg/m^3	89	50	150

Substance (µg/m^3)	(Average)	WHO Guideline	NAAQS (USEPA)	World Bank Guideline
NO_2 (ppb)	43	40[1]	100[2]	150[2]
SO_2(ppb)	2	20[2]	80[2]	125[2]
CO (ppb)	0.33	NA	NA	NA
VOC(ppb)	0.04	NA	NA	9 ppm (8hr)

(MAGWE REGION)
Aung Lan/ Meikhtila/ Myanaung/ Kyangin

Aunglan


122 km to The Wethtikan Wetland Bird Sanctuary
97 km to The Shwesettaw Wildlife Sanctuary
Untitled Placemark
Untitled Placemark
Untitled Placemark
19 16' 00" 95 11' 30"
101.50km to The Pegu Yomas National Park
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
©2007 Google
Pointer 19°25'56.91" N 95°01'49.61" E elev 363 ft
Streaming 100%
Eye alt 360.33 mi

Aunglan

Parameter	Average	WHO	NAAQS (USEPA)
TSPM 24-hr avg (range) µg/m^3	336	100	NA
PM10 24-hr avg (range) µg/m^3	44	50	150

Substance (µg/m^3)	Average	WHO Guideline	NAAQS (USEPA)	World Bank Guideline
NO_2 (ppb)	30	40[1]	100[2]	150[2]
SO_2(ppb)	0.2	20[2]	80[2]	125[2]
CO (ppb)	0.5	NA	NA	NA
VOC(ppb)	0.1	NA	NA	9 ppm (8hr)

Meikhtila

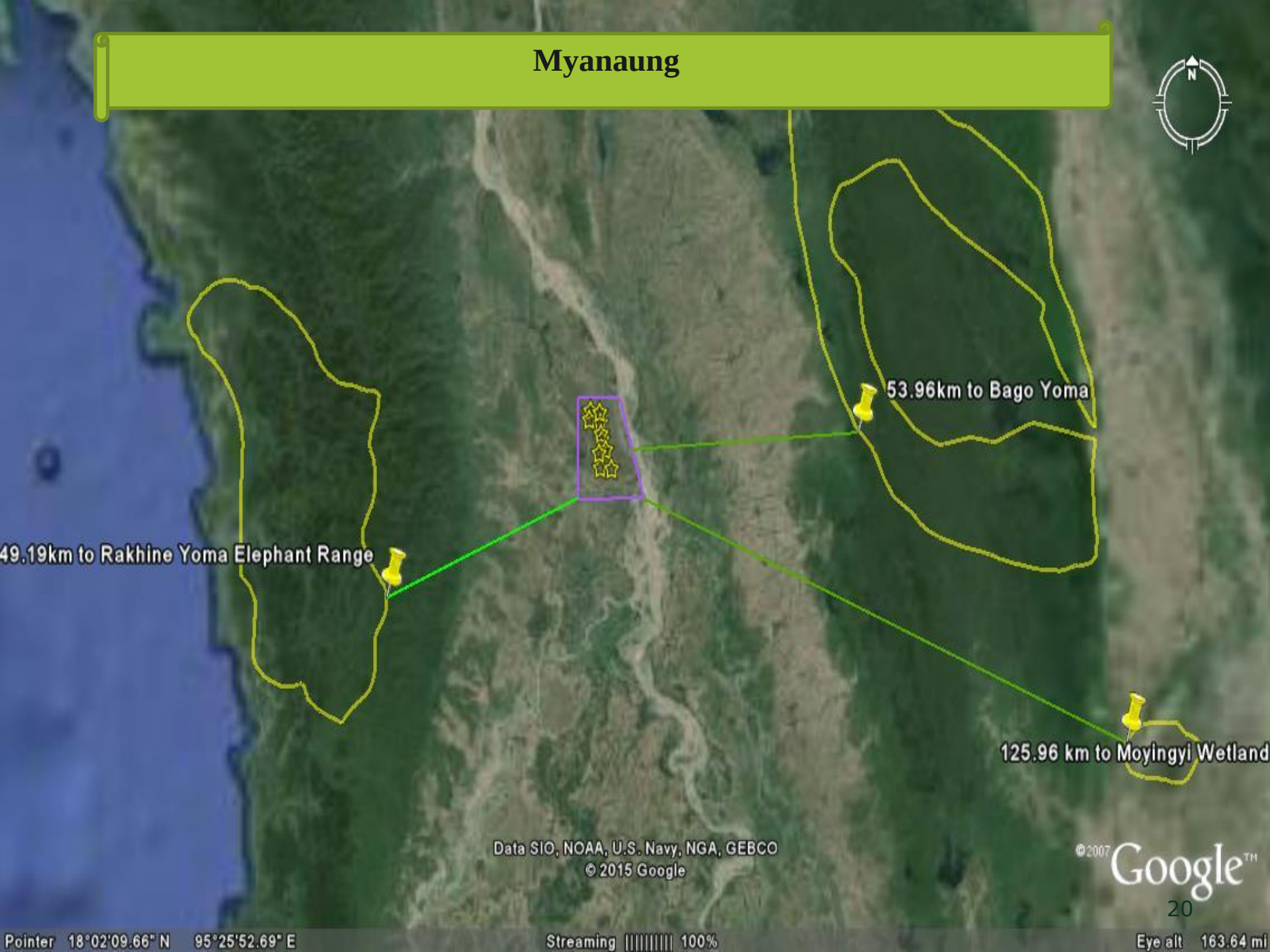

74.74 km toThe Meinmahla Kyun Wildlife Sanctuary
42.16 km to The Minwuntaung Wildlife Sanctuary
35.29 km to The Lawkananda Wildlife Sanctuary
9.32 km toThe Popa Mountain Park
Untitled Placemark
Untitled Placemark
72.98 km to The Shwesettaw Wildlife Sanctuary
Untitled Placemark
81.33 km to Tanlwe-ma-e-chaung
78.82 km to Taungup Pass Thandwe-chaung
25.60 km to The Pegu Yomas National Park
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
©2007 Google
Pointer 19°51'44.43" N 95°22'05.64" E elev 624 ft
Streaming 100%
Eye alt 609.76 mi

Meikhtila

Parameter	Average	WHO	NAAQS (USEPA)
TSPM 24-hr avg (range) µg/m^3	196	100	NA
PM10 24-hr avg (range) µg/m^3	59	50	150

Substance (µg/m^3)	Average	WHO Guideline	NAAQS (USEPA)	World Bank Guideline
NO_2 (ppb)	29	40[1]	100[2]	150[2]
SO_2(ppb)	1	20[2]	80[2]	125[2]
CO (ppb)	0.1	NA	NA	NA
VOC(ppb)	0.04	NA	NA	9 ppm (8hr)

Myanaung

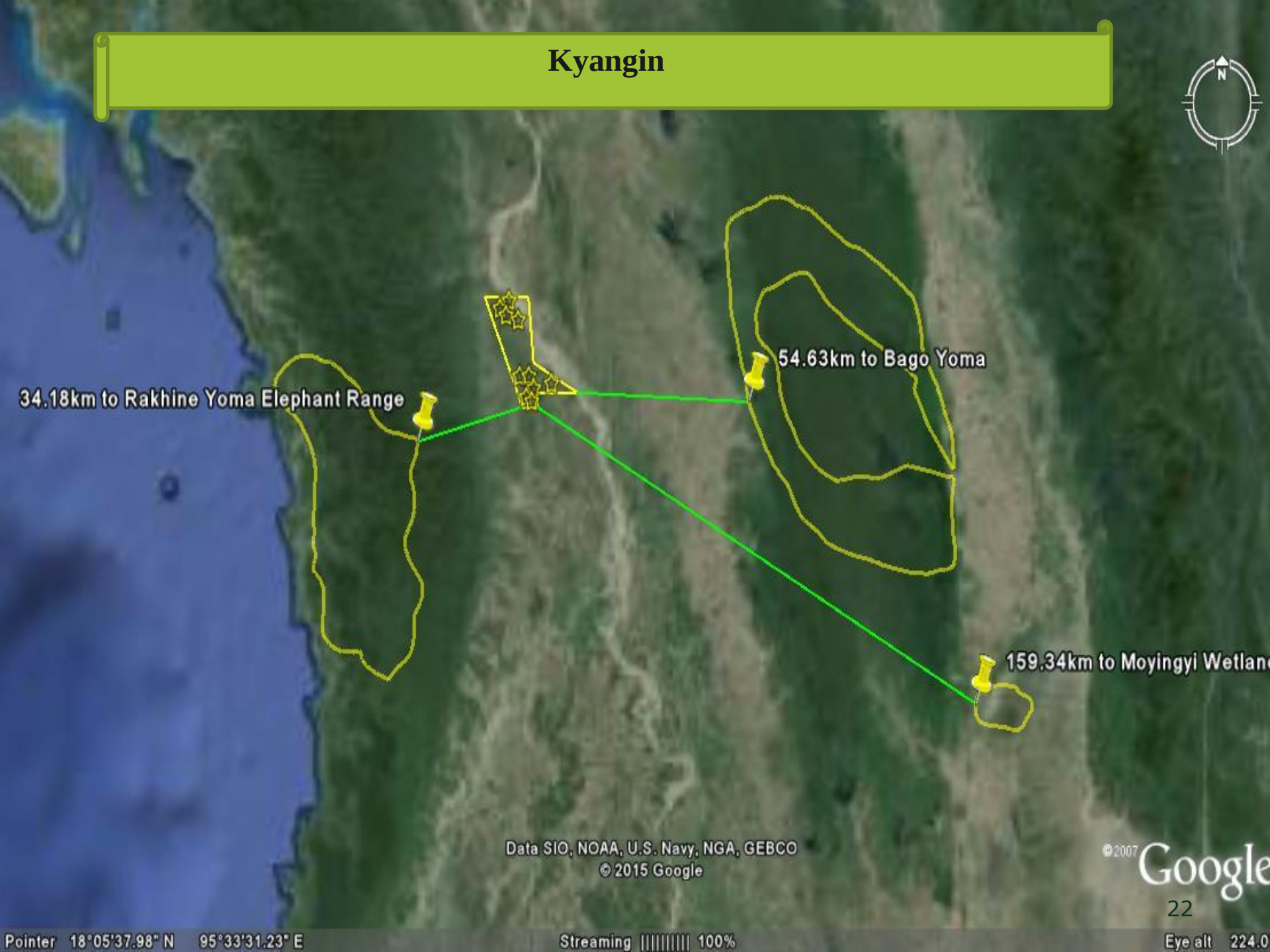

53.96km to Bago Yoma
49.19km to Rakhine Yoma Elephant Range
125.96 km to Moyingyi Wetland
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2015 Google
©2007 Google™
Pointer 18°02'09.66" N 95°25'52.69" E
Streaming 100%
Eye alt 163.64 mi

Myanaung

Parameter	Average of IOR-7	WHO	NAAQS (USEPA)
TSPM 24-hr avg (range) µg/m^3	536	100	NA
PM10 24-hr avg (range) µg/m^3	114	50	150

Substance (µg/m^3)	IOR-7(Average)	WHO Guideline	NAAQS (USEPA)	World Bank Guideline
NO_2 (ppb)	38	40[1]	100[2]	150[2]
SO_2(ppb)	71	20[2]	80[2]	125[2]
CO (ppb)	187	NA	NA	NA
VOC(ppb)	75	NA	NA	9 ppm (8hr)
NH_3 (ppm)	1	NA	NA	9 ppm (8hr)

Kyangin


34.18km to Rakhine Yoma Elephant Range
54.63km to Bago Yoma
159.34km to Moyingyi Wetlan
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2015 Google
©2007 Google
Pointer 18°05'37.98" N 95°33'31.23" E
Streaming 100%
Eye alt 224.0

Kyangin

Parameter	Average of IOR-5	WHO	NAAQS (USEPA)
TSPM 24-hr avg (range) µg/m^3	315	100	NA
PM10 24-hr avg (range) µg/m^3	67	50	150

Substance (µg/m^3)	IOR-5(Average)	WHO Guideline	NAAQS (USEPA)	World Bank Guideline
NO_2 (ppb)	36	40[1]	100[2]	150[2]
SO_2(ppb)	43	20[2]	80[2]	125[2]
CO (ppb)	159	NA	NA	NA
VOC(ppb)	160	NA	NA	9 ppm (8hr)
NH_3 (ppm)	1	NA	NA	9 ppm (8hr)

Air Impact Assessment

- To identify the Environmental, Socio-Economic impacts of a proposed project before decision making
  - To identify the potential air quality impacts due to emissions from proposed projects
  - To set priorities for pollution control

Air Impact Assessment

- To consider alternative project design at an early stage and identification of the most suitable site in terms of benefit maximization and harmful minimization
- To compliance with air pollution control regulations
- To formulate environmentally sound air policies and plans

Ambient Air Quality Standards

Evaluation of air quality

- **WHO guidelines**

- **USEPA, NAAQS**

Ambient Air Quality Standards in industrialized countries

- IFC guideline

Needs for Air Monitoring

- *National Ambient air quality standards*
- *Guidelines for Emission*

Air Impact Assessment

- Construction Phase
- Operation Phase
- Decommissioning Phase

Air Impact Assessment

- **Dust emission and concentration**
  - **Well pad**
  - **Camp pad**
  - **Road construction**
- **Greenhouse Gases (CH_4, N_2O, CO_2)**
  - **Laterite Transport**
  - **Drilling Rig transport**
  - **Drilling Material transport**
  - **Heavy Equipment Use**
  - **Diesel Generators to Power Drill Rig and Camp Site**
  - **Diesel Generators to Power Equipment During Testing**
  - **Flaring During Testing**
  - **Well Abandonment Phase**

Identification of Potential Significant Impacts

Significance = Characteristics x Importance

Impact Characteristics =Magnitude + Extent + Duration

Based on the scoring,

Impact Significance – *High, Medium, Low*

Modeling

- ***Simulation modeling*** **is used to forecast the impacts , which is *not yet in operation*.**

- ***A mathematical description*** **of the meteorological transport and dispersion processes, for a specific period**

- ***Realistic Estimates of pollutant concentration and impacts*** **for specific locations and times**

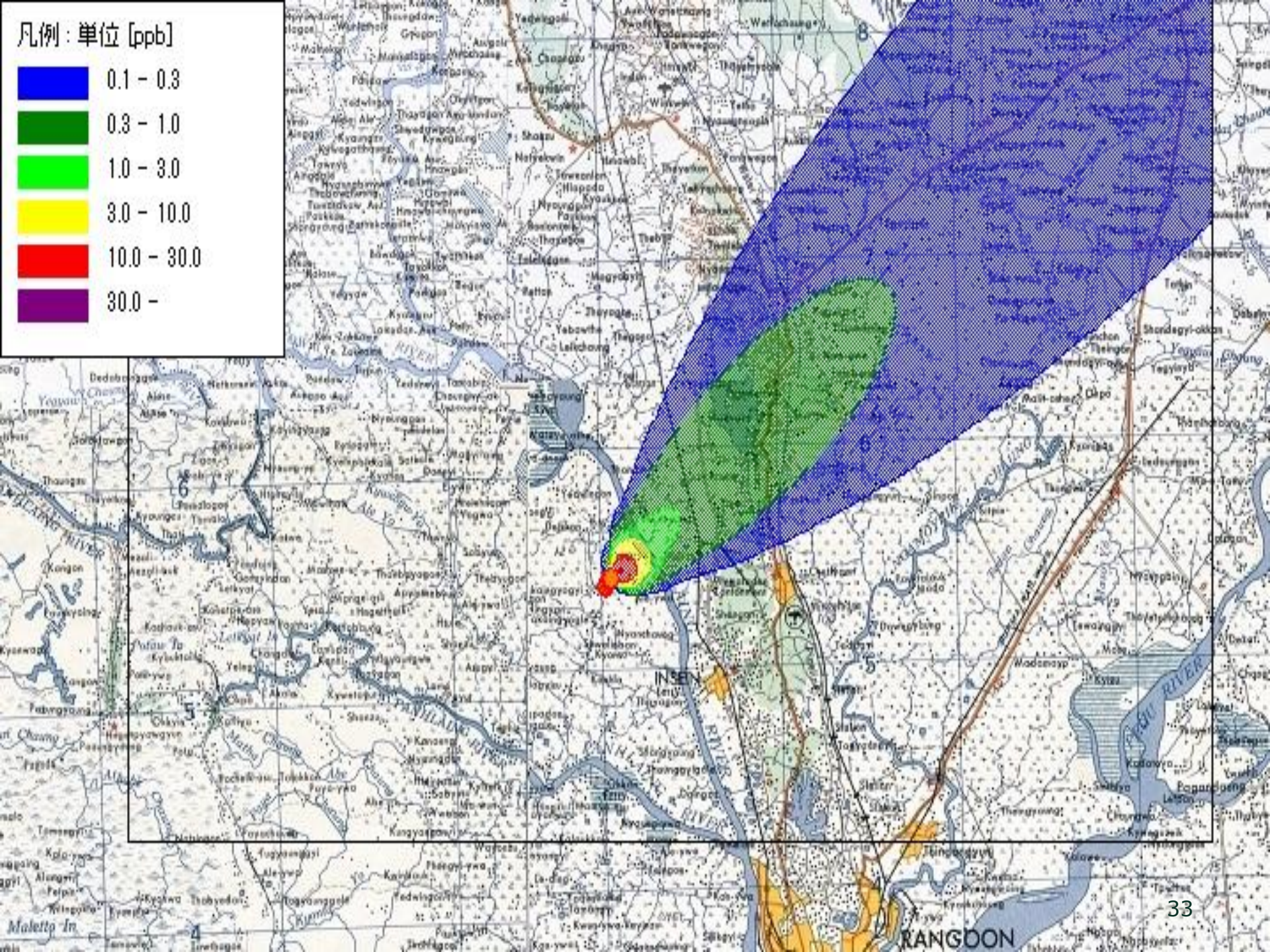
Air Dispersion Modeling

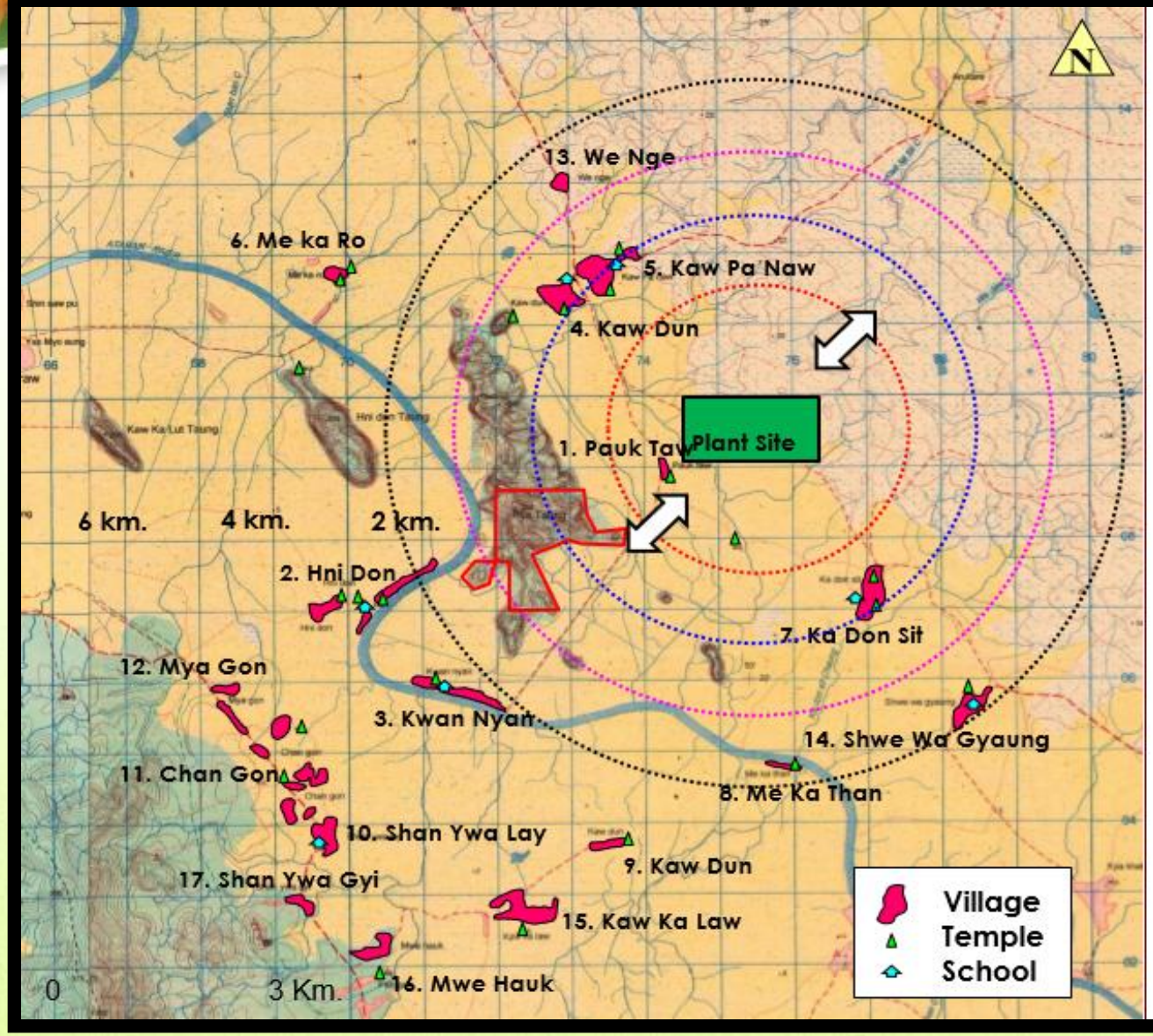
- **U.S. EPA's SCREEN3** ***Gaussian Air Dispersion modeling***

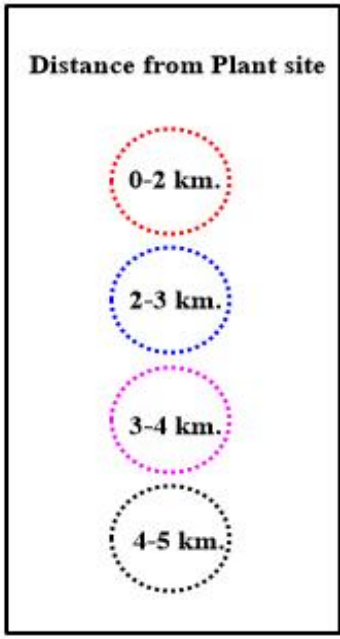
- **Ground level concentrations** ***(GLC)*** **- calculated on the automated distance array option extending** ***from within 200 m to 50 km radius from the point*** **source**

- **The calculation of** ***1hr, 24 hour and annual emission rates*** **shall be based on both normal 100% operating loads** ***as the worst case scenario*** **and conservative approach**

- ***Screening & Regulatory*** **approach**


凡例：単位 [ppb]
0.1 - 0.3
0.3 - 1.0
1.0 - 3.0
3.0 - 10.0
10.0 - 30.0
30.0 -
INSEIN
RANGOON

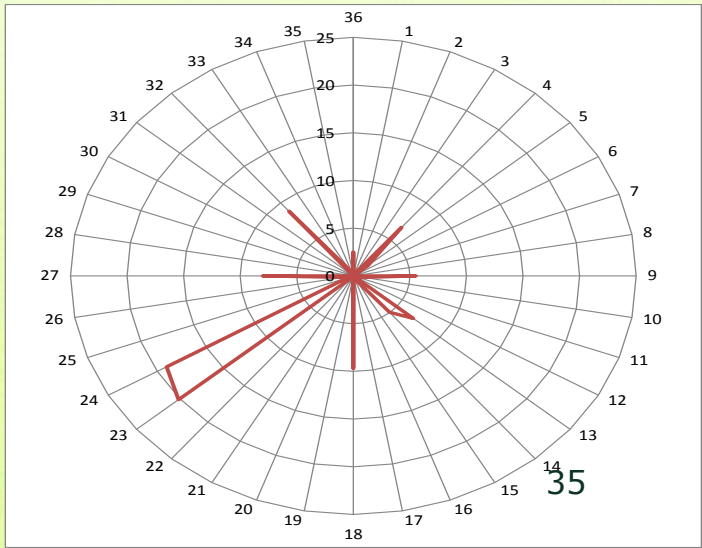




Wind direction

Needs to be improved

- **Improved in comprehensive meteorology data**



Needs for air modeling

- Exit velocity, and increasing exit temperature will increase the plume rise
- The plume rise, together with the physical stack height,
- Meteorology
- Emission rate (g/s)
- Wind speed (m/s)
- Air temperature (degree C)
- Stability Class (Pasquill)
- Stack height (m)
- Stack diameter (m)
- Exit temperature (degree C)
- Distance from stack (display parameter)
- Building measurement

Information such as operating design from the concerned developer is very important

References:

- Nigel Rossouw (2003); Sippe (1999); and United Nations University (2007). The Environmental Impact Assessment Guidance.
- Noel De Nevers, 2000. Air pollution control engineering. McGRAW-HILL international editions 2000.
- Ohnmar May Tin Hlaing et al., 2009. Air Quality Monitoring in Yangon and Mandalay City during 2007-2008: The State of Ambient Air Quality in Selected Urban Areas in Myanmar Health Research Congress, 2009 Abst. P-55
- Part III 40 CFR Part 51 Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule, 2005. Environmental Protection Agency, November 9, 2005. Source: www.cabq.gov/airquality/pdf/aqd_model_guidelines.pdf
- SCREEN3 Model User's Guide, 1995, EPA-454/B-95-004 U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division Research, September 1995
- USEPA, National Ambient Air Quality Standards, Source: http://www.epa.gov/air/criteria.html
- Villalvazo, L., Davila, E., and Reed, G., 2007, Guidance for Air Dispersion Modeling. Source: www.valleyair.org/busind/pto/tox.../Modeling%20Guidance.pdf
- WHO air quality guidelines 2005
- IPCC (2006)
- EMEP/EEA air pollutant emission inventory guidebook (2009)
- http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-b-road-transport.pdf
- http://www.grida.no/publications/other/ipcc_tar/
- US.EPA, “Compilation of Air Pollution Emission Factors, Volume 1, Stationary Point and Area Sources”, Fifth Edition, January 1995; http://www.epa.gov/ttn/chief/ap42/ch03/bgdocs/b03s03.pdf.
- IEA (2004), Density of Oil Products, Energy Statistics Working Group Meeting


Thank You