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Esri Indonesia
Petroleum User Group

Oil & Gas in Industrial Revolution 4.0 and Esri ArcGIS GeoAI Capabilities

Dicky Tarmizi (Industry Sales Lead Esri Indonesia)

Petroleum User Group Forum Balikpapan East Kalimantan September 6-7, 2018

View media

Menu of The Day

1. Relationship between Oil & Gas Industry and Indonesia Government Budget (APBN)
2. Geo Artificial Intelligence & Making Indonesia 4.0
3. Oil & Gas Industry 4.0 and Esri ArcGIS

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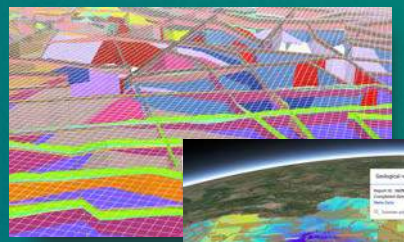
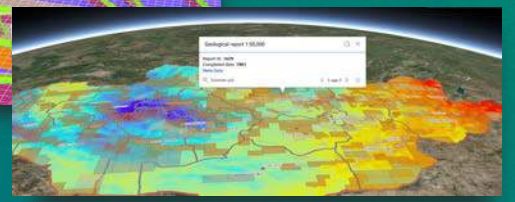
Geologic Fences



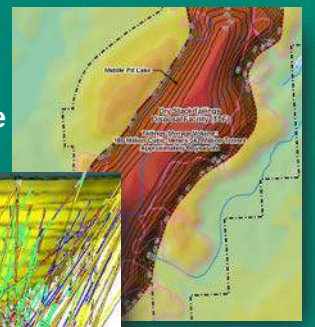
England

Geoscience Resources



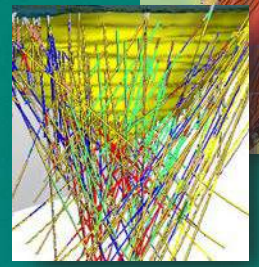
Mongolia
Mineral Resources and Petroleum Authority

Mine Tailings Modeling



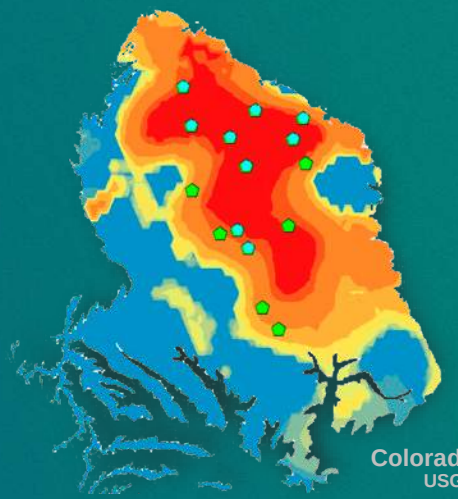
Michigan
Foth

Borehole Geology



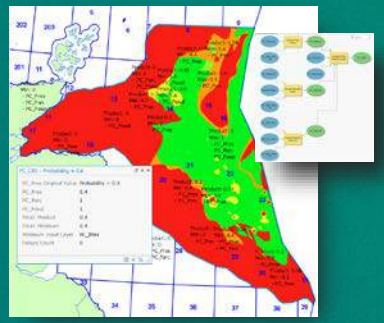
Michigan
Foth

Optimum Well Selection



Colorado
USGS

Exploration



North Sea
Exprodat

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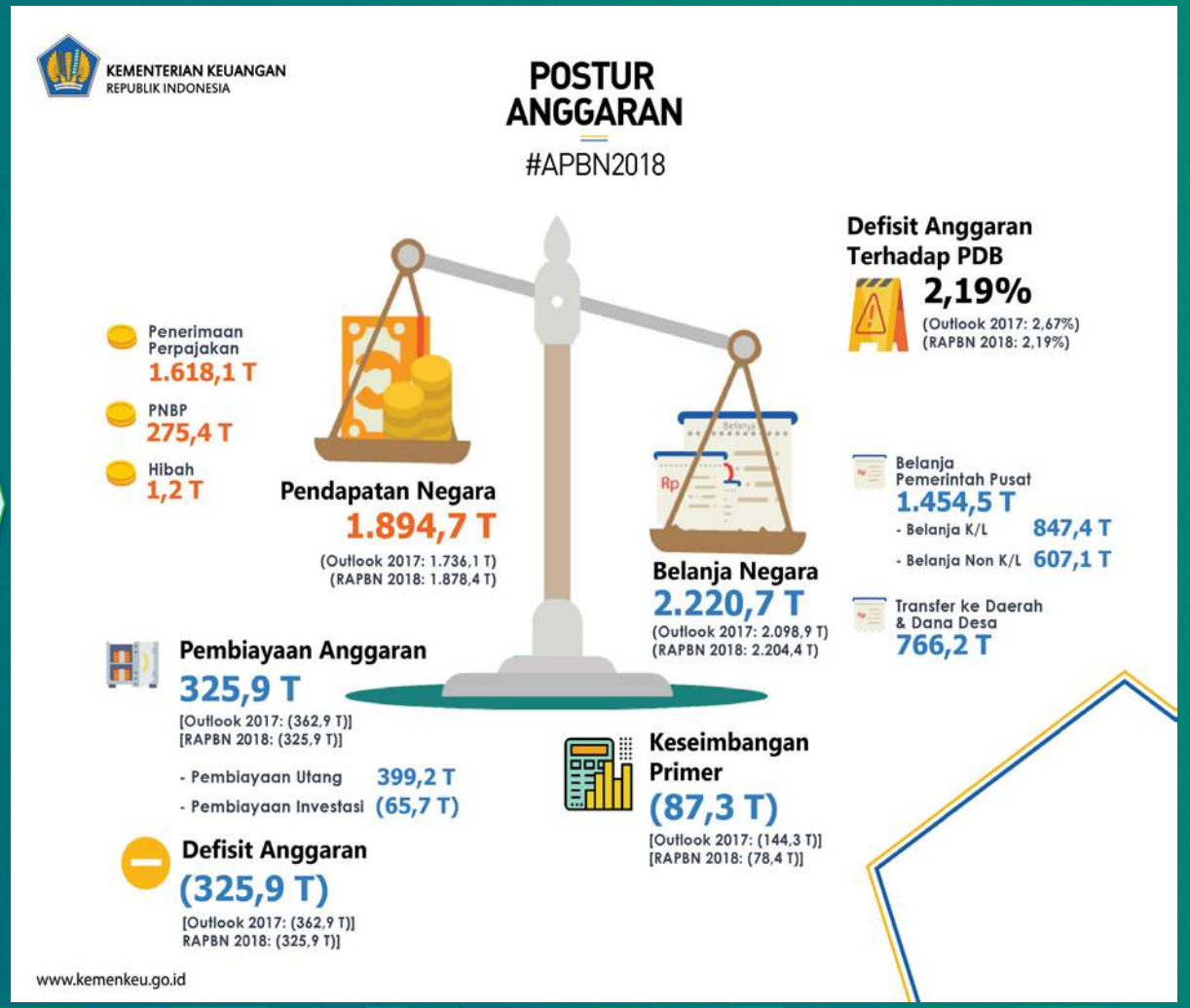
Relationship between Oil & Gas Industry and Indonesia Government Budget (APBN)

Oil & Gas Play Significant Role in Indonesia Economy and Government Budget

- *Contribute IDR80T to APBN 2018 Revenue*
- *Part of Energy Subsidy Spending IDR163T*



Source: https://www.kemenkeu.go.id/apbn2018, Pixabay

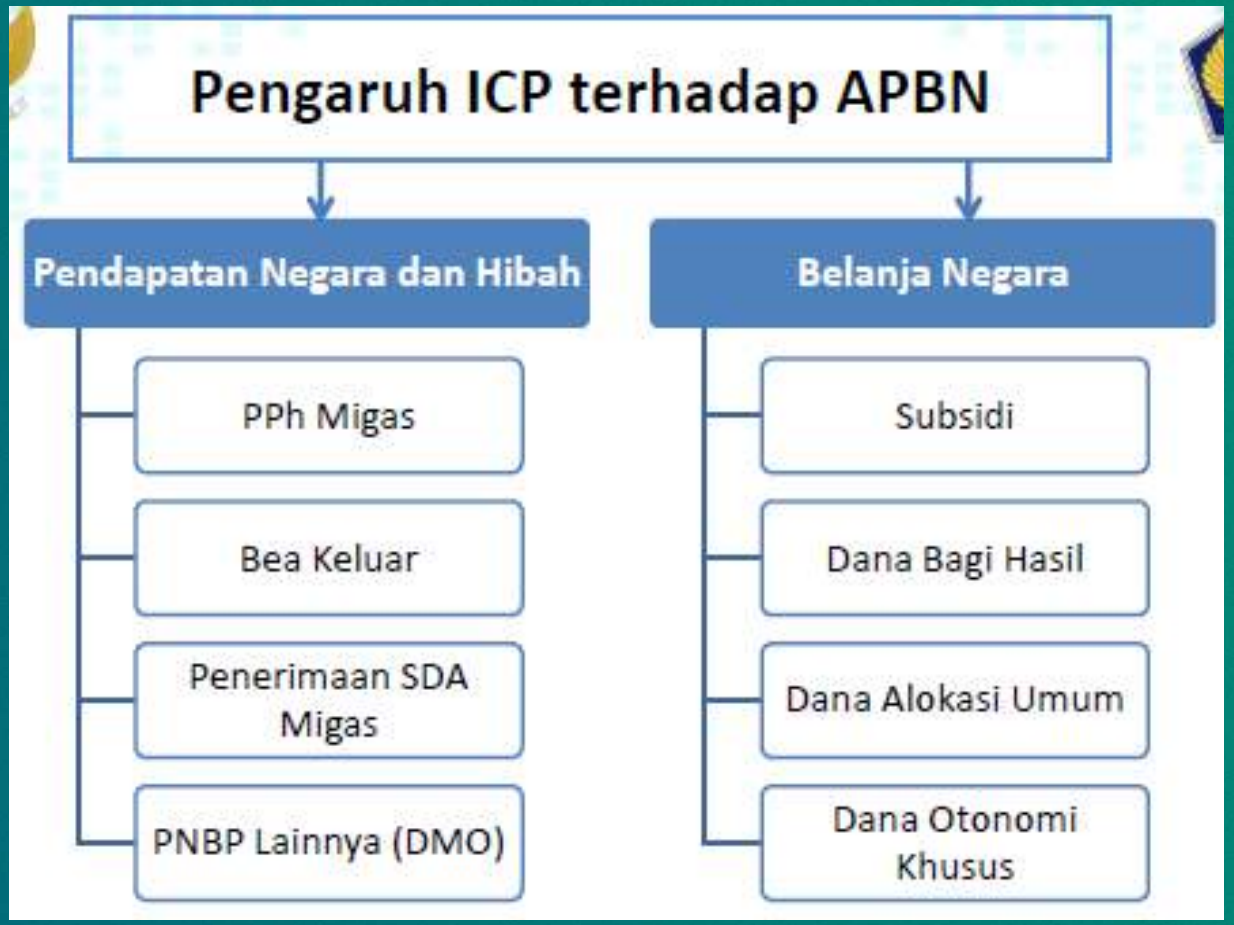
ICP Price and Production Lifting of Oil & Gas Affect Many APBN Components

APBN Revenue side:

1. *Tax Revenue from Oil & Gas companies*
2. *Export tax & customs*
3. *Non Tax revenue*

APBN Spending side:

1. *Energy subsidy (petrol & electricity price)*
2. *Dana Bagi Hasil (DBH)*
3. *Dana Alokasi Umum (DAU)*
4. *Dana Otonomi Khusus*



Source: Wibowo, Heru, "Peranan Sektor Migas sebagai Sumber Pendapatan APBN dan APBD" DJA Kemenkeu September 2015

Roadmap from KKKS to APBN

- KKKS CPI
- KKKS MCLTD
- KKKS PEP
- KKKS PHM
- KKKS PHE ONWJ
- KKKS CNOOC
- KKKS COPHI
- KKKS PCGKII
- KKKS CIC
- KKKS PCIJ
- KKKS VICO
- KKKS BOB
- KKKS PHE WMO

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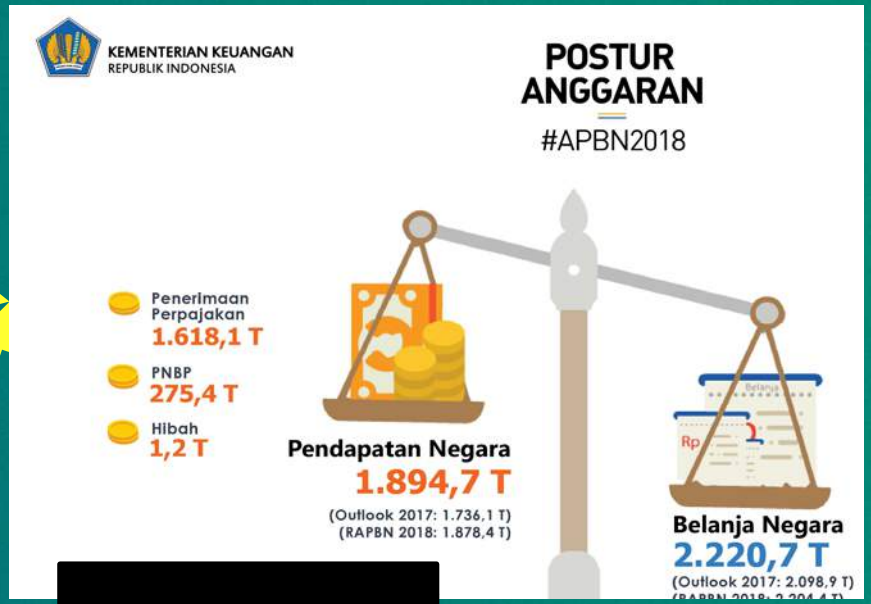
KEMENTERIAN KEUANGAN
REPUBLIK INDONESIA

KEMENTERIAN ESDM
REPUBLIK INDONESIA



	Realisasi s.d. Sept 2017	APBN-P 2017
Pertumbuhan Ekonomi (%)	5,01*	5,2
Inflasi (% yoy)	3,7	4,3
Nilai Tukar (Rp/USD)	13.331	13.400
Suku Bunga SPN (%)	5,0	5,2
Harga Minyak (US$/barrel)	48,9	48
Lifting Minyak (ribu barrel/hari)	794,2**	815
Lifting Gas (ribu barrel/hari)	1.112,8**	1.150

The certainty of KKKS production will increase APBN assurance

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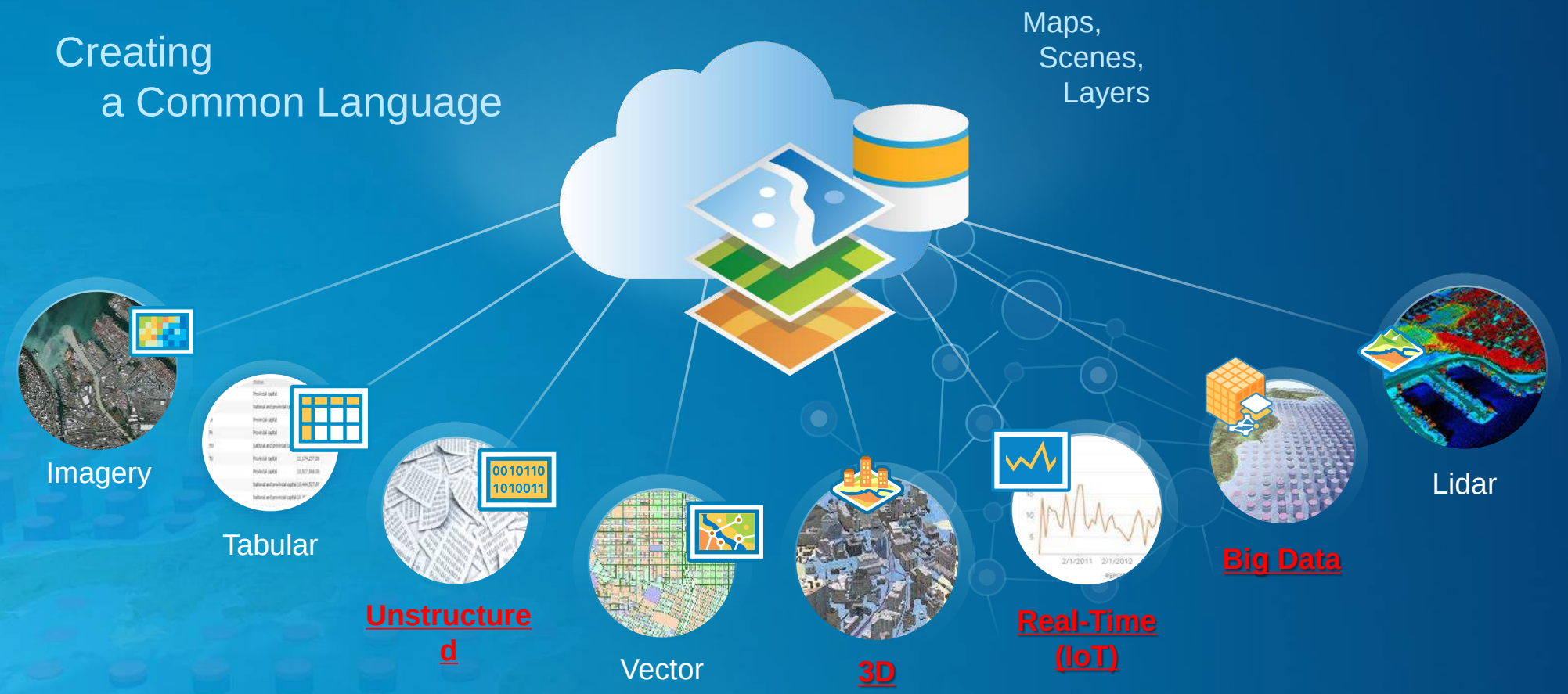
Geo AI and Making Indonesia 4.0

ArcGIS

Integrates All Types of Data



Artificial Intelligence, Machine Learning, Deep Learning

ARTIFICIAL INTELLIGENCE

"The construction of complex machine that possess the same characteristic as human intelligence"

Reasoning

Knowledge Representation

Perception

Natural Language Processing

Robotics

Machine Learning

MACHINE LEARNING

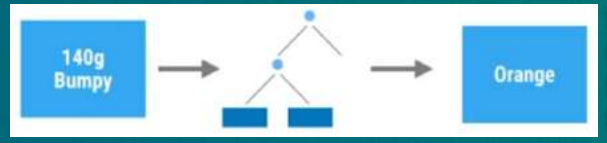
"The field of study that gives computers the ability to learn without being explicitly programmed" (Arthur Samuel)

SUPERVISED LEARNING

1. ***Training*** ***FEATURES*** ***LABELS***

	Weight	Texture	Label
Examples	150g	Bumpy	Orange
	170g	Bumpy	Orange
	140g	Smooth	Apple
	130g	Smooth	Apple
	...	...	...

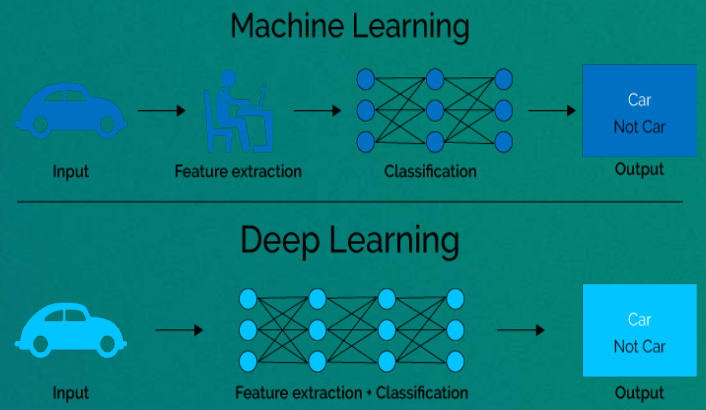
2. ***Predicting***



UNSUPERVISED LEARNING
REINFORCEMENT LEARNING

DEEP LEARNING

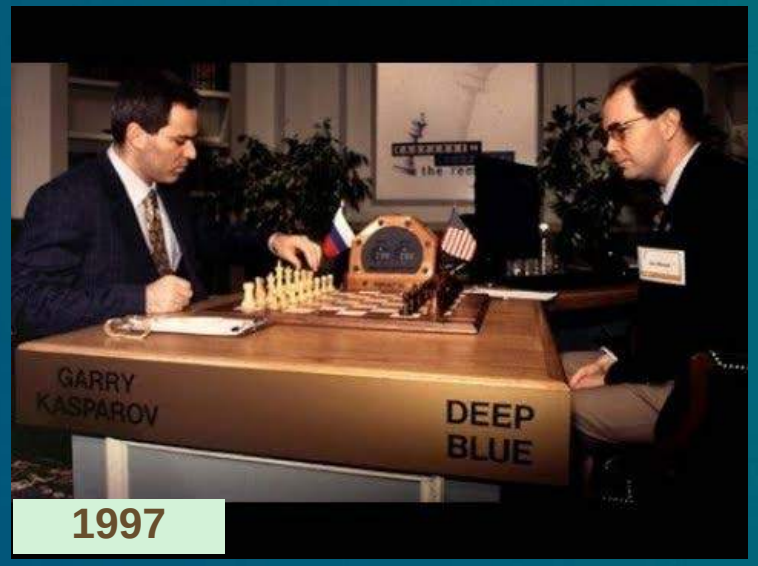
DEEP SUPERVISED LEARNING



Dog
(NOT Cat)

When Iron Man "Jarvis" become alive:

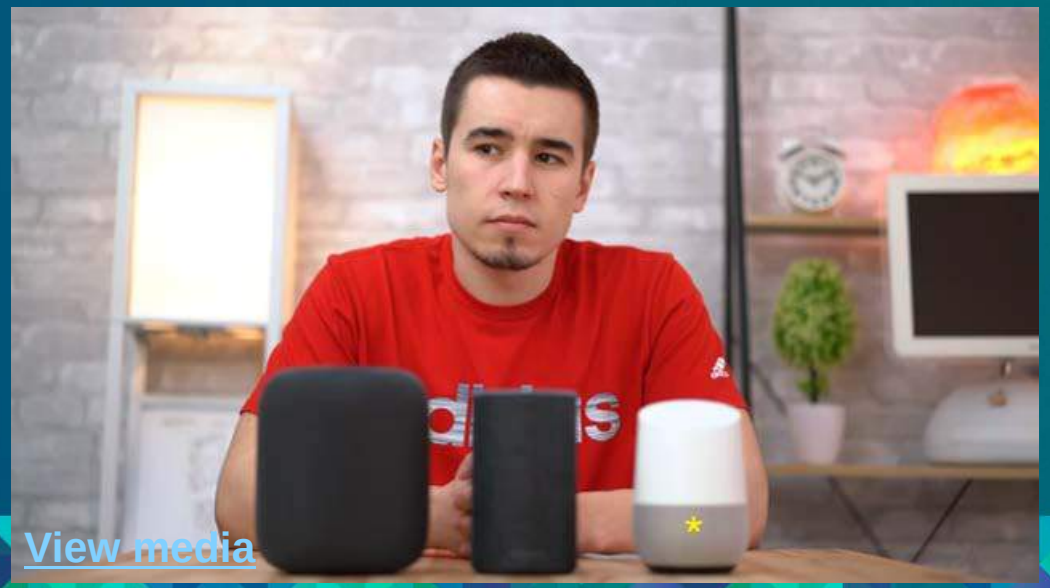
IBM Watson win Jeopardy, Siri chats with Alexa & Google Home



1997

2011

2017

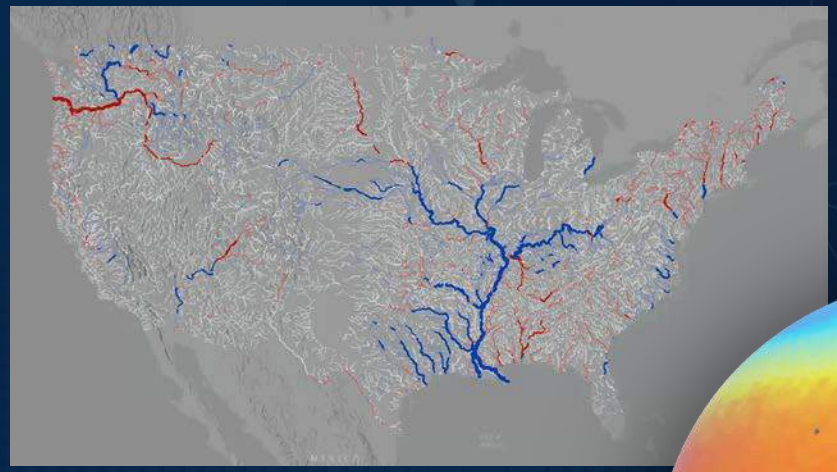


View media

View media

Earth Observations Combined with GIS and AI

Provide Real-Time Global Intelligence



Flood Prediction

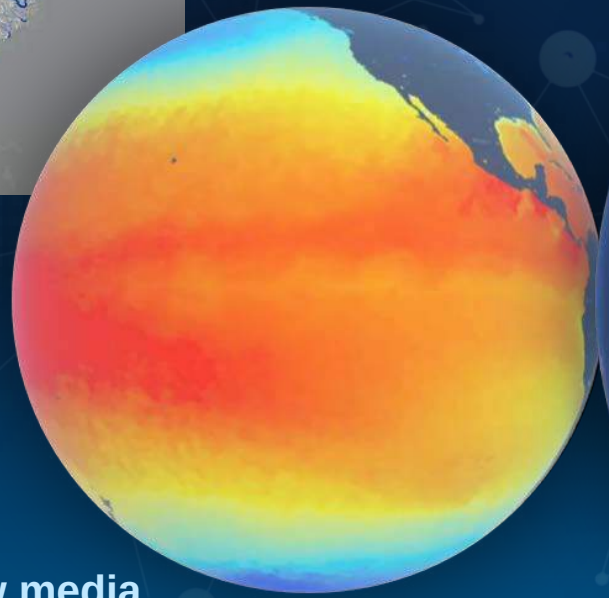
Ecological Land Units

View media

Human Footprint

View media

Sea Surface Temperature



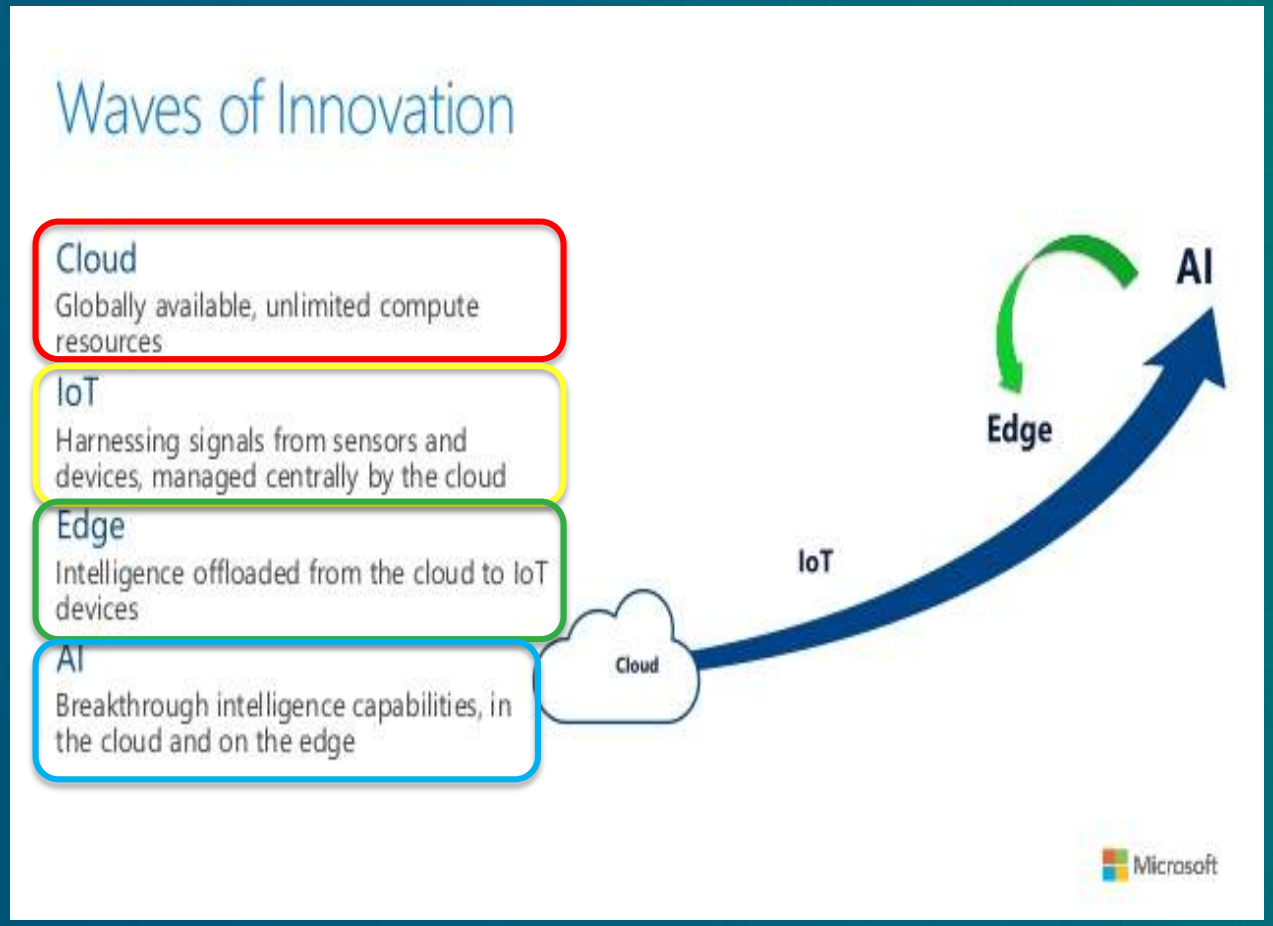
View media

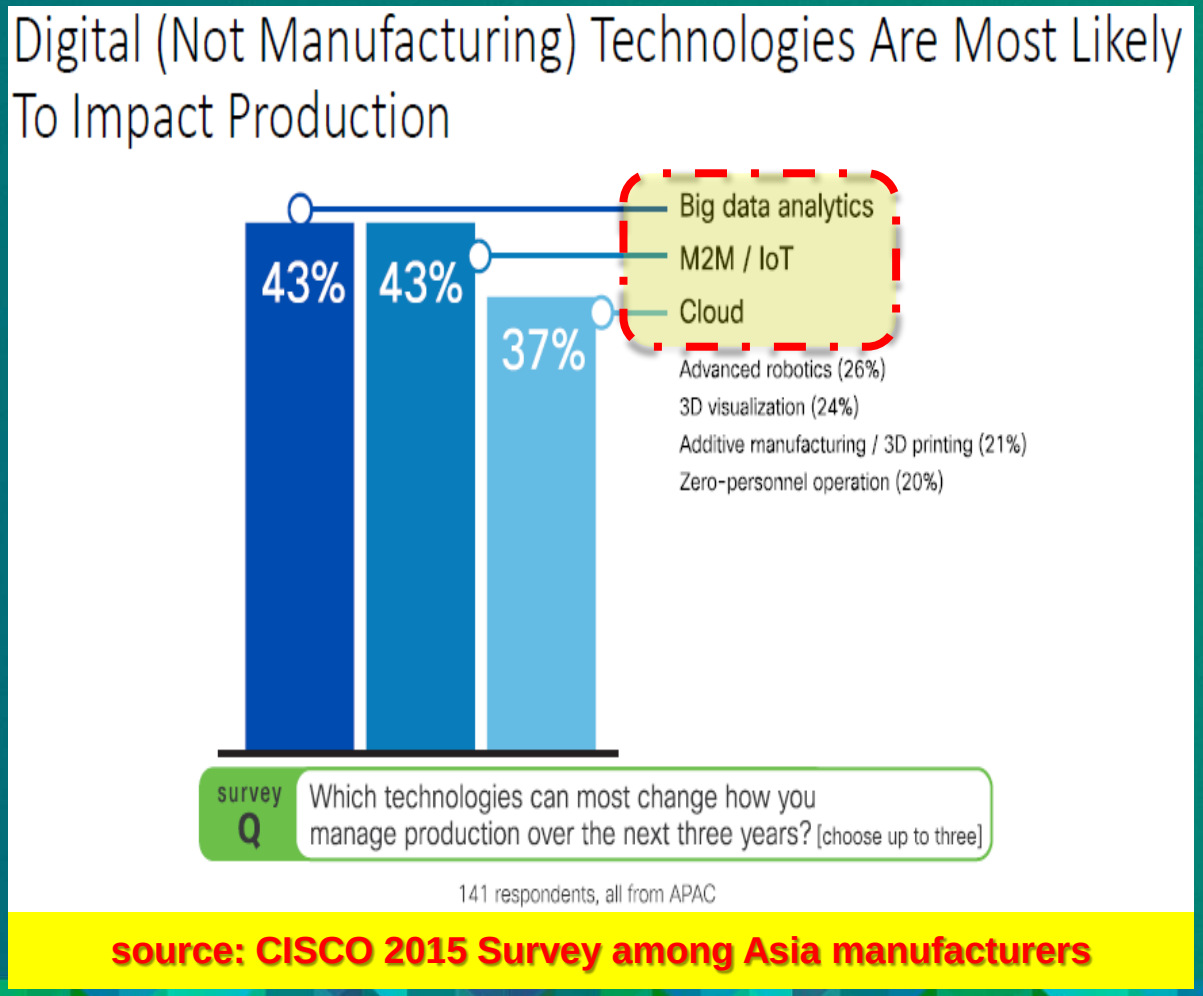
Helping Us Understand, Predict, and Make Decisions at Many Scales.…

Artificial Intelligence in GIS: GeoAI in Real World

Use Case: Accidents Prediction for more targeted accident reduction

4IR from Industry view: *Big Data Analytics (AI)*, *IoT* & *Cloud* are Key Tech that will Impact Operation Process in Next 3 Years





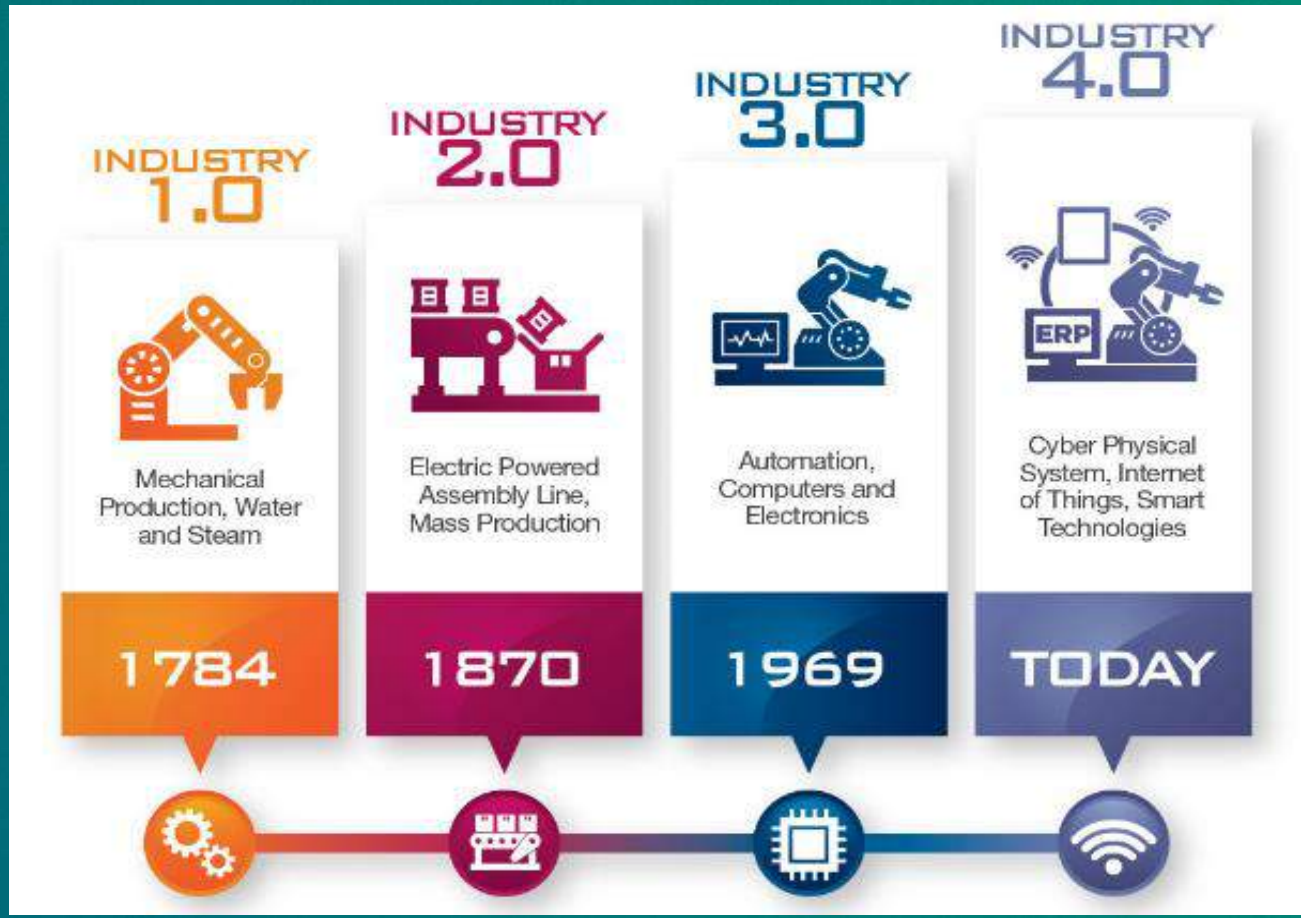
source: CISCO 2015 Survey among Asia manufacturers

Source: https://www.cisco.com/c/dam/en_us/solutions/industries/manufacturing/digital-manufacture-english.pdf, Microsoft presentation Esri UC 2018

"Making Indonesia 4.0" Initiative to Achieve Global GDP Economy Rank #10 in 2030

- **Industry 4.0** (The Fourth Industrial Revolution, **4IR**) is *The Automation & Data Exchange in Production technologies* that include:
  - **Artificial Intelligence** (**AI**)
  - **Internet of Things** (**IoT**)
  - **Cloud Computing**
  - **Smart Technologies** (inc wearables, 3D printing) etc

- Indonesia Government, led by Kementerian Perindustrian, launched **"Making Indonesia 4.0" Roadmap March 2018**

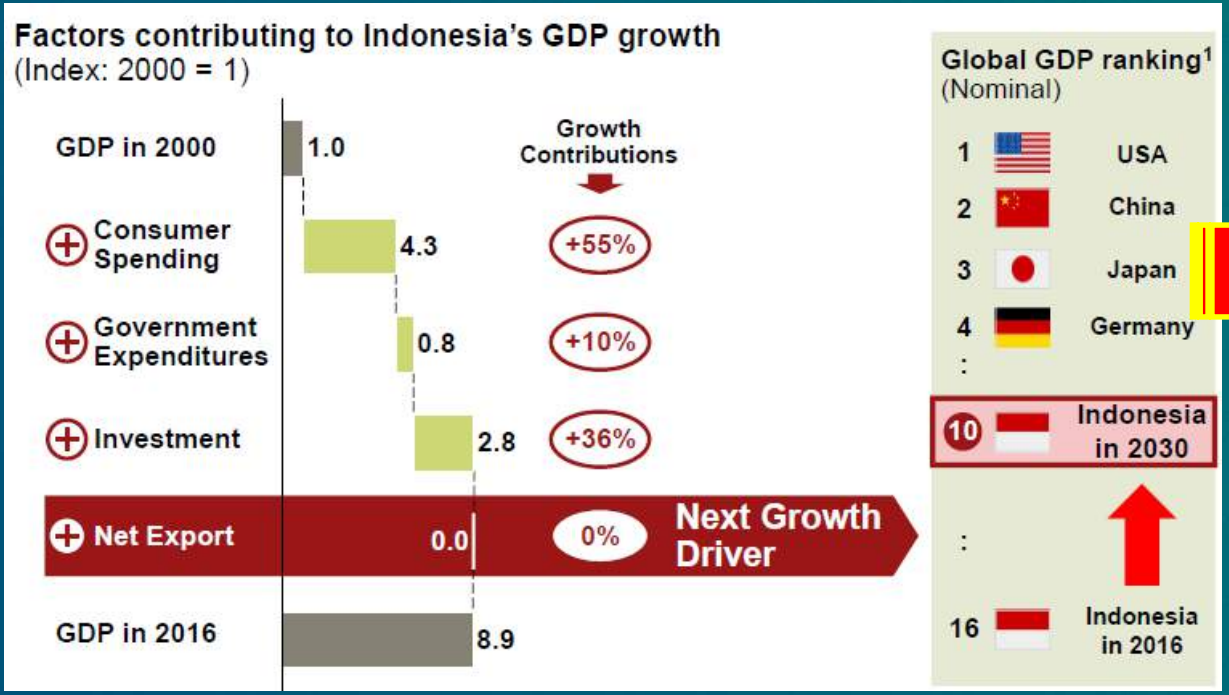


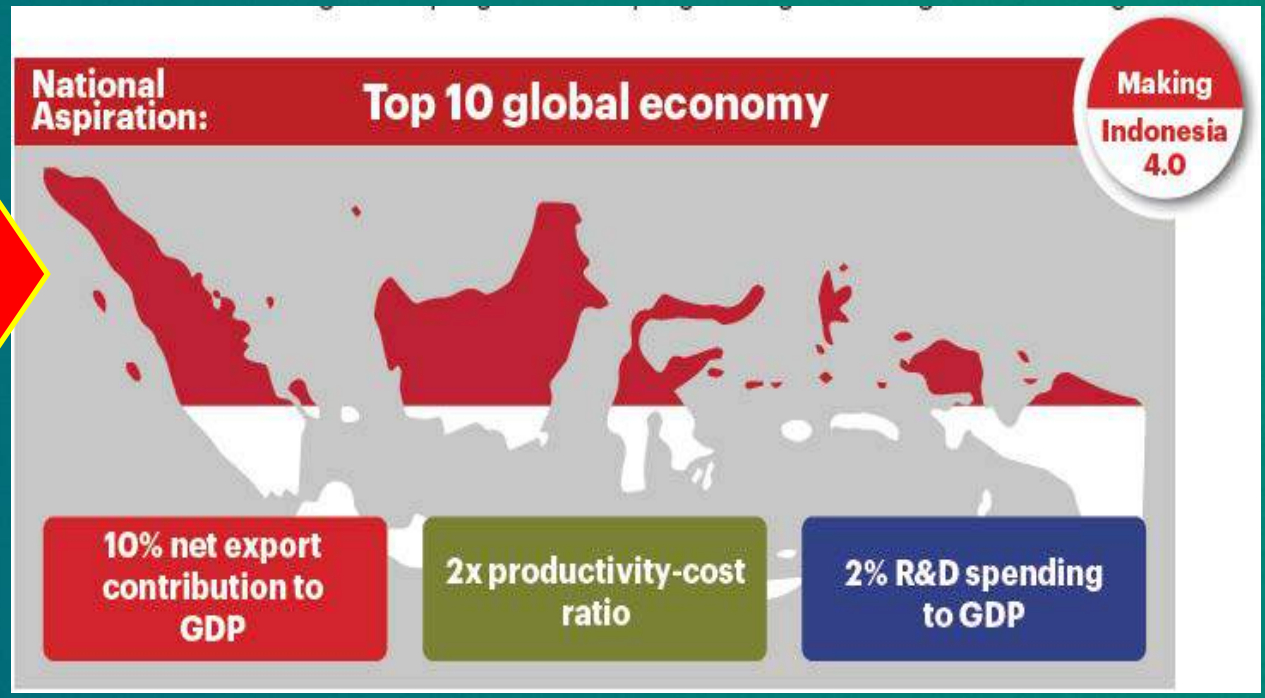
Source: http://www.metaltech.com.my/getattachment/press/news/News-14/IndustrialRevolution.jpg.aspx

"Making Indonesia 4.0" is Roadmap to Push Net Export, Double Labor Productivity & Increase R&D

Currently Indonesia **Global GDP Rank 16th** with Consumption is Key Driver → The **Goal is to Ran 10th in 2030 with Net Export** as The New Driver

To Achieve 10th Global GDP Rank, Indonesia must **Push Net Export** (10% of GDP contribution), **Double labor productivity/cost ratio** (match India) and **Increase R&D Spending** by 0.7pct (match China)





Source: http://www.kemenperin.go.id/iis2018

Role Kementerian ESDM in “Making Indonesia 4.0”

Peran setiap Kementerian pada Making Indonesia 4.0

Prioritas nasional terkait

Kementerian Keuangan	• **Dukungan finansial** untuk seluruh aktivitas Making Indonesia 4.0 mis. Insentif R&D&D, CAPEX, pengembangan SDM, FDI, tarif impor, pendanaan untuk UMKM	9 10 +Keseluruhan pendanaan inisiatif
Kementerian Perindustrian	• **Peluncuran Making Indonesia 4.0** • **Detail peta jalan 5 sektor prioritas** Making Indonesia 4.0 • Menetapkan kebutuhan industri untuk seluruh prioritas nasional	Seluruh prioritas nasional
Kementerian Perdagangan	• **Penyelarasan kesepakatan perdagangan** dengan peta jalan Making Indonesia 4.0	6 10
Kementerian Koordinator Bidang Ekonomi	• **Penyelarasan kebijakan antar K/L dalam lingkup koordinasinya** • **Melakukan *Debottleneck* koordinasi** dengan kementerian koordinasi lainnya	2 10 Koordinasi seluruh inisiatif
Kementerian Pekerjaan Umum dan Perumahan Rakyat	• **Penyelarasan peta jalan dan proyek infrastruktur** dengan Making Indonesia 4.0 (terintegrasi dengan peta jalan zona industri nasional)	2
Kementerian Energi dan Sumber Daya Mineral	• **Penyelarasan peta jalan energi nasional** dengan peta jalan zona industri nasional • **Program peningkatan produktivitas** untuk energi dan sumberdaya	1 2 3

1 Perbaikan alur aliran material

- Memperkuat **produksi material sektor hulu**; contoh 50% dari bahan baku petrokimia yang masih impor

2 Mendesain ulang zona industri

- Membangun **peta jalan zona industri nasional (mis. industry belts)**; mengatasi permasalahan yang dihadapi di beberapa zona industri

3 Akomodasi standar *sustainability*

- **Kesempatan daya saing melalui tren *sustainability* global,** mis. EV, biofuel, energi terbarukan

Source: http://www.kemenperin.go.id/iis2018

If Low Tech Industry can implement 4IR, Then Oil & Gas as Capital Intensive Industry should enable 4IR in the Operation

Control Factory Machines Thru Gadget in F&B Plan

Spinning process in textiles factory that already involves robotic in part of its process

Source: http://www.kemenperin.go.id/iis2018, http://www.timlo.net/baca/25140/pabrik-baru-sritex-100-peralatan-dari-china-hi-tech/

4IR Tech in Oil & Gas: Can Generate $90Bio Savings thru Connected Operations *Plus Support Lifting Target Achievement*

Industry	Segment	Type of savings	Estimated value over 15 years (Billion nominal US dollars)
Aviation	Commercial	1% fuel savings	$30B
Healthcare	System-wide	1% reduction in system inefficiency	$63B
Rail	Freight	1% reduction in system inefficiency	$27B
Power	Gas-fired generation	1% fuel savings	$66B
Oil and Gas	Exploration and development	1% reduction in capital expenditures	$90B

Note: Illustrative examples based on potential one percent savings applied across specific global industry sectors. Source: GE estimates

Source: http://www.kemenperin.go.id/iis2018 (General Electric)

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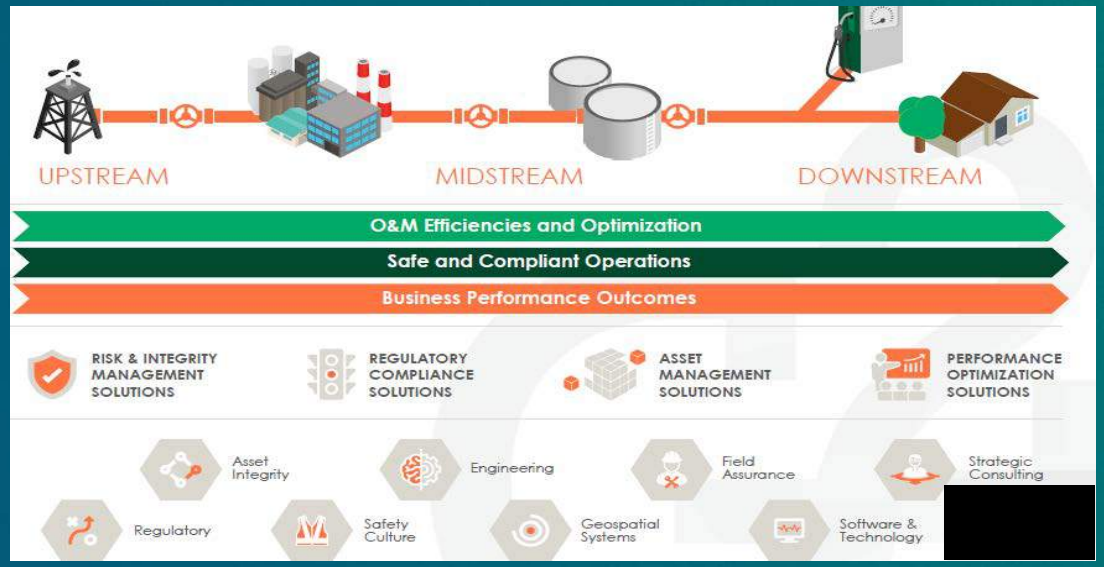


Oil & Gas Industry 4.0 and Esri ArcGIS

ArcGIS

Empowers All Aspects of the Organization

System of Record

Data Management
and Integration

System of Engagement

Sharing, Collaboration,
and Dissemination

System of Insight

Analytics, Models,
and Data Exploration

. . . Leveraging the Power of Location

ArcGIS Include Machine Learning and Integrates AI

New and Improved

- Clustering
- Prediction
  - Classification
  - Regression
  - Interpolation
- Object Identification

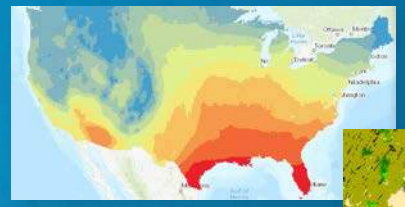
Coming

- Feature Extraction
- Site Selection
- Event Prediction
- Image Analysis

ArcGIS

Density-Based Clustering

Empirical Bayesian Kriging Regression Prediction



Forest-Based Classification and Regression

Training Data Preparation

Machine Learning Geoprocessing Tools

Python Integration

AI

Frameworks

- CNTK
- TensorFlow
- scikit-learn

Platforms

- Microsoft
- IBM Watson
- Amazon

Accident Prediction

Feature Identification

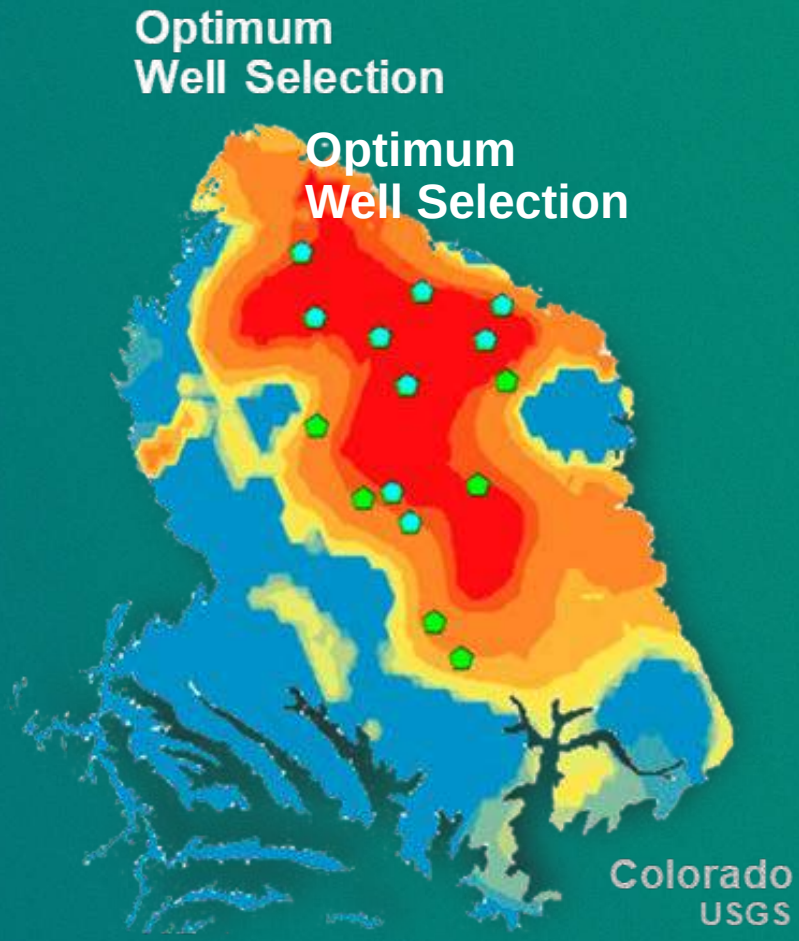
Feature Extraction

Property Condition Survey

4IR Benefit Oil & Gas Industry for Lifting Achievement, More Efficient Operation and Minimize Operational Disruption

4IRD Benefits for Oil&Gas can be Achieved thru:

- *Drilling Optimization*
- *Well monitoring and optimization*
- *Production planning and monitoring*
- *Asset Integrity Management/ Asset Performance Management*
- *Supply chain management/ optimization etc*

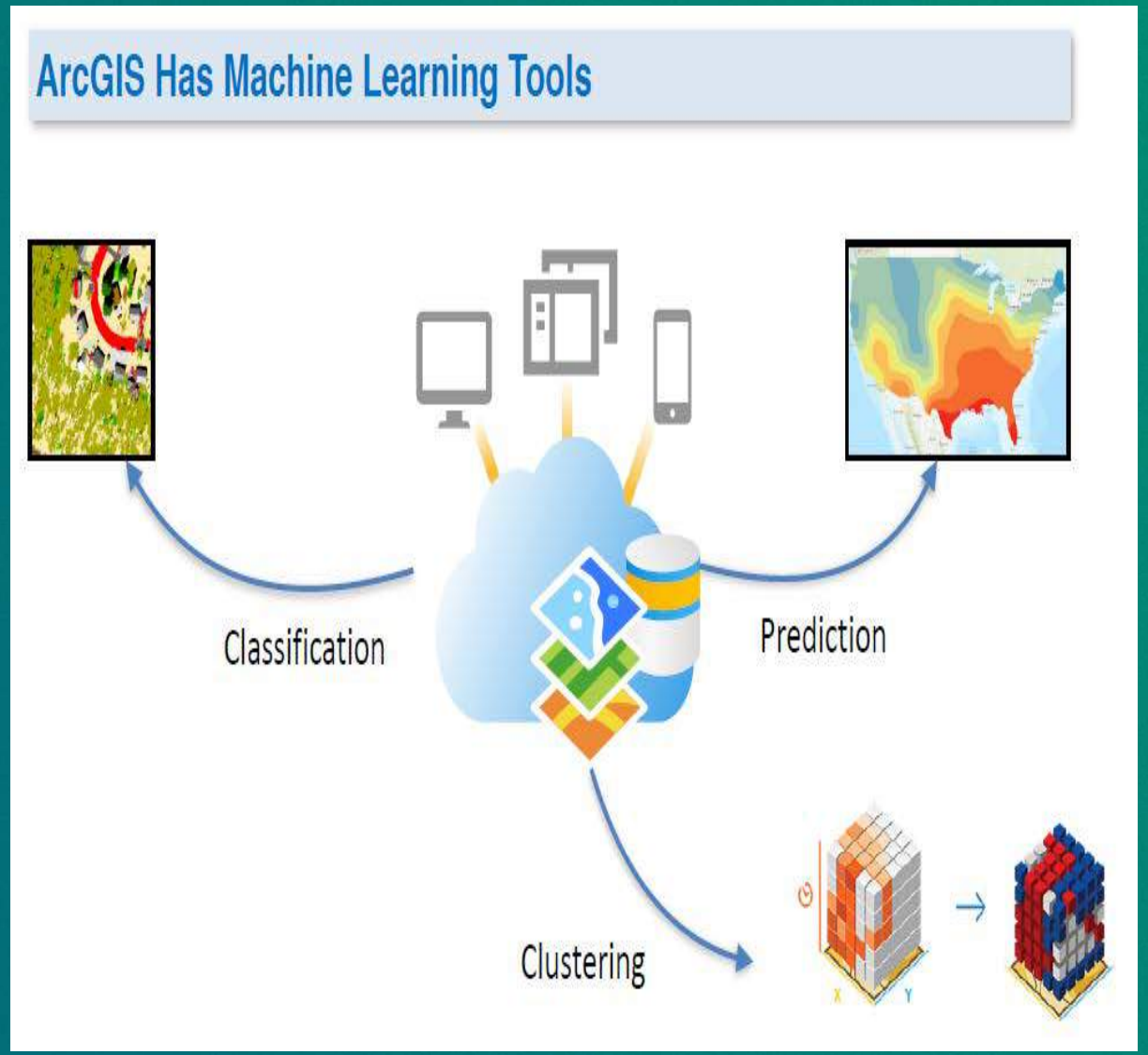


Esri ArcGIS GeoAI Equipped with AI Machine Learning Tools

CLASSIFICATION: Maximum Likelihood Classification, Random Trees, Support Vector Machine

PREDICTION: Empirical Bayesian Kriging (EBK) Regression Prediction, Areal Interpolation, Ordinary Least Squares Regression, Geographically Weighted Regression

CLUSTERING: Spatially Constrained Multivariate Clustering, Density-based Clustering, Image Segmentation, Hot Spot Analysis, Space Time Pattern Mining



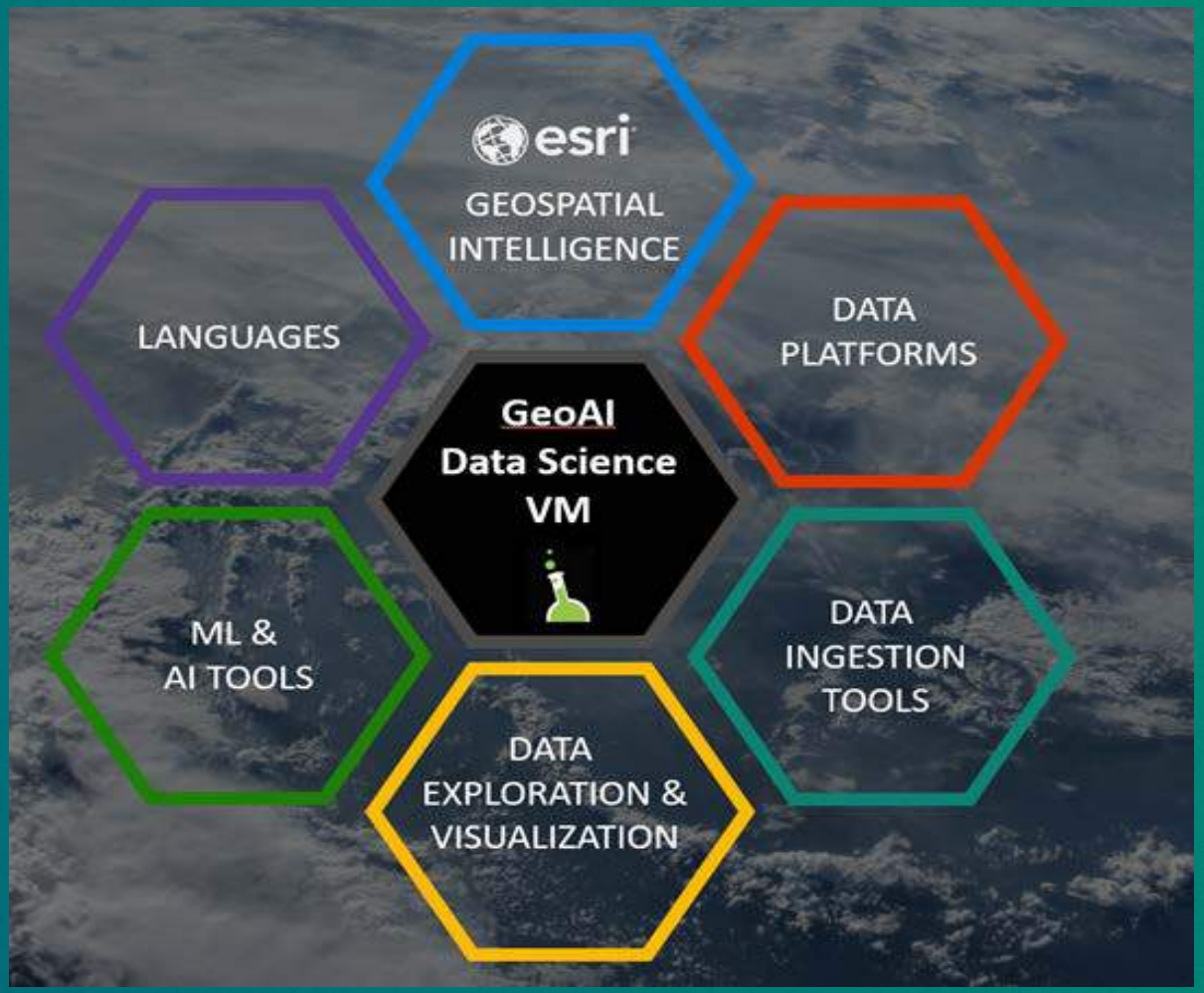
Esri ArcGIS GeoAI Use Cases

Smart Road Digitization in Oil Field area

Predictive Incident Analytics based on historical incidence

Fleet analytics for optimum fleet management

Optimum Well Selection

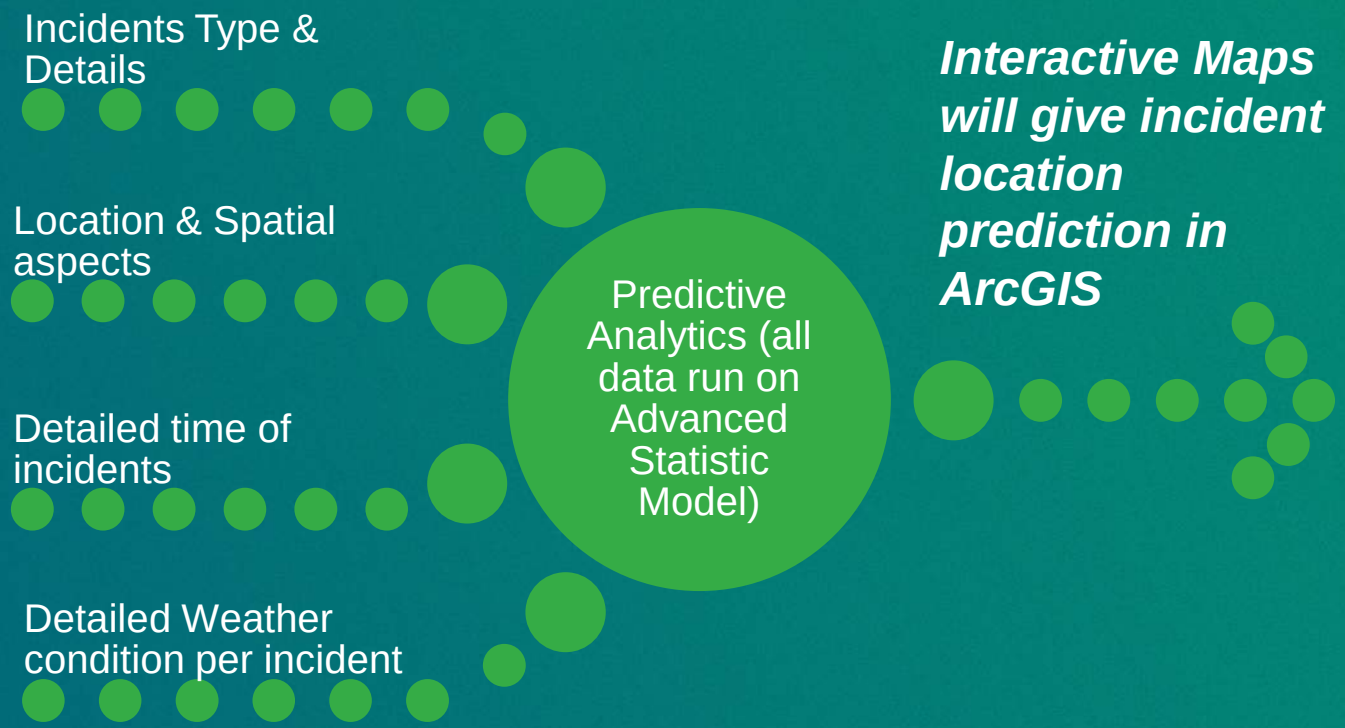


Smart Road Digitization in Oil Field area

- ArcGIS can help plot most efficient Road in new remote Oil Field area by using GPS breadcrumbs from several trucks that visited area for several d
- Done by ArcGIS using DBSc PCA, & Elastic Maps

Geo AI Analytics can Predict Incidence Type and Time in several Locations

- **ArcGIS Pro with Scikit Learn XGBoost can integrate *sensor data* with *seismic activity*, *drilling logs*, *cores*, *completion design*, *production data*, *maintenance records* → Mechanical equipment failure can be predicted to optimize operational plan**



GeoAI is used for Fleet Management Analytics to Minimize Operational Disruption

Chevron Pacific Indonesia (CPI) is Indonesia largest oil producer

CPI Duri field is the largest with 5000 wells, 8900 employees + contractors in 5000 Ha area with 300 miles road and 700 bridges.

CPI developed iJMS system based on Esri ArcGIS to manage 5000+ GPS equipped fleet owned by 70 contractors.

CPI use iJMS to monitor route deviation, unsafe driving behavior, safest route plan and recognize driver's fatigue. iJMS system shared to 13 various control rooms.

GeoAI for Optimum Well Selection

Optimum Well Selection

Will be shared by Mr Ramdhani Fajri during afternoon session

Let’s Support Indonesia RAPBN 2019

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To Support Indonesia RAPBN 2019, let’s Support SKK Migas to Achieve Lifting Target by using 4.0 Tech:

- Geo Artificial Intelligence
- Cloud Computing (ArcGIS Cloud)
- Smart Technologies (AR, VR etc)
- Internet of Things (IoT)

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PERTAMINA HULU MAHAKAM

Questions Maybe?

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PERTAMINA HULU MAHAKAM

Thank You

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