

Open Data Open Possibilities

**"Finding the Needles in a Haystack":
Identification of Illegal Dumping of Construction
Waste Using Urban Big Data**

Dr Wilson Lu
Department of Real Estate and Construction

iLab: The urban big data lab



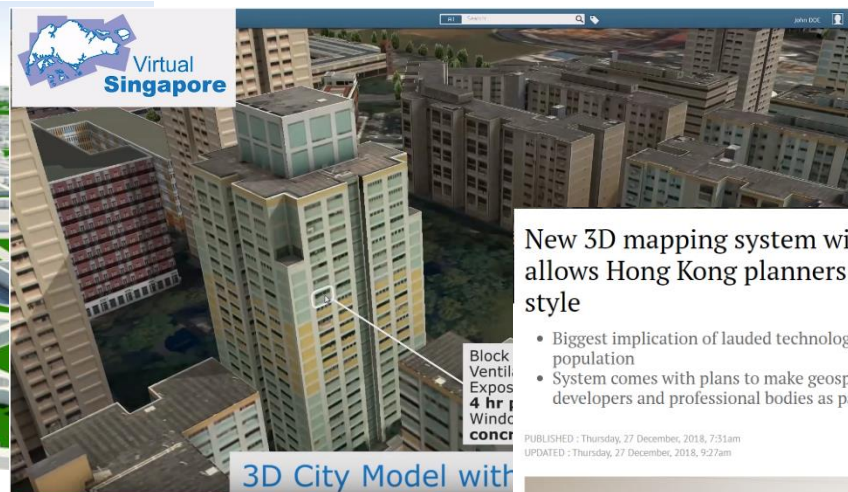
- iLab is an urban big data hub housed in **KB715** of the Knowles Building.
- It facilitates multi-dimensional and multi-disciplinary **urban big data collection, storage, analysis, and visualisation** to inform decision-making in smart city development.
- iLab is a repository for **urban big data from multiple sources** including Geographical Information Systems (GIS), Global Positioning Systems (GPS), Urban Remote Sensing (URS), satellite and airborne Remote Sensing (RS), Building Information Modeling (BIM), and facilities and asset management.
- iLab works closely with **other groups in HKUrbanLab**.
- iLab also **has its own unique research remit** to integrate big data in pursuit of various development in relation to smart city.

To develop an urban “digital twin” for smart city development

INTERDISCIPLINARY
QUICK
TALKS



Berlin, Germany (BlueModels)



Virtual Singapore

New 3D mapping system with one-stop data source allows Hong Kong planners to build urban sites in 'SimCity' style

- Biggest implication of lauded technology is ability to cater to needs of grey population
- System comes with plans to make geospatial data accessible to public for app developers and professional bodies as part of smart city push

PUBLISHED : Thursday, 27 December, 2018, 7:51am
UPDATED : Thursday, 27 December, 2018, 9:27am

Star ONLINE

News Business Sport Metro Tech Lifestyle Opinion Videos Property Jobs Autos More

TOPICS Yearstarter 2019 Yearender 2018 1MDB True or Not Do You Know Star Golden Hearts Award

Building Hong Kong, 'SimCity' style

TECH NEWS

Thursday, 27 Dec 2018
12:30 PM MYT



By Naomi Ng



The upgrade would start with a small section of Central as a trial area and gradually release data



London, UK (Vertex Modelling)



New York, USA (3D Tiles)

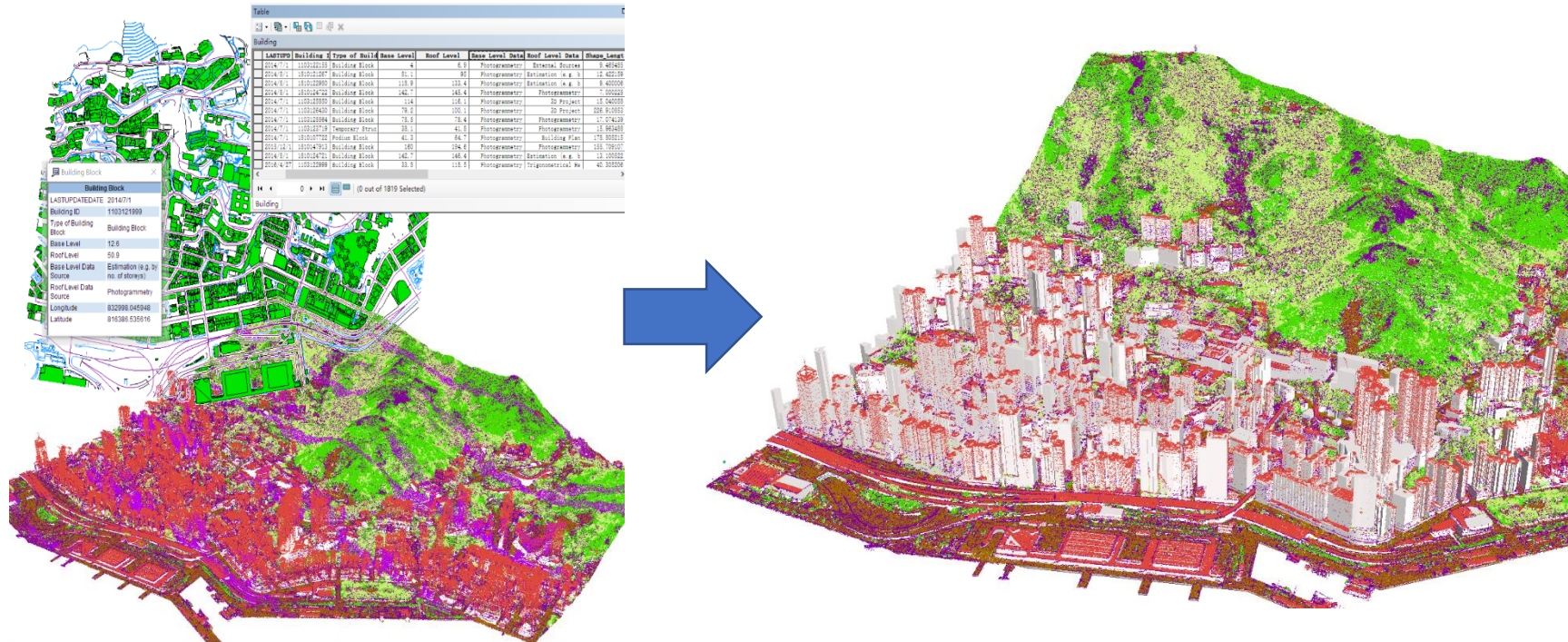


Hong Kong (Sources: Lands D)

<https://www.landsd.gov.hk/mapping/en/news/3DSD/FullScreen.html>

The digital twin with LoD I

(Blocks model comprising prismatic buildings with flat roof structures)



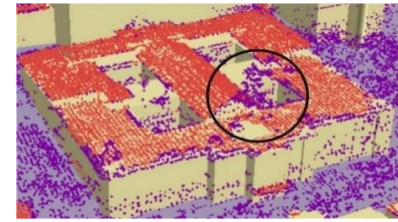
A 2 km×2 km area in northwestern Hong Kong Island, containing 1361 blocks of densely distributed buildings of varying heights and shapes

iB1000 (topographic map purchased from Lands Department of HKSAR. It is in Geodatabase (GDB) format with a scale of 1:1000; contains feature datasets including buildings, land cover, transportation, etc)

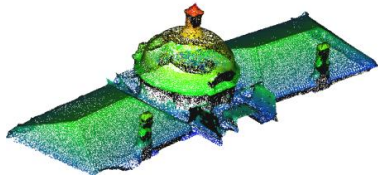
air-borne LiDAR (provided by the Civil Engineering and Development Department of HKSAR. It, comprising buildings, roads, and many other urban features, was collected between 1 December 2010 and 8 January 2011 by the CEDD by hiring an airborne LiDAR surveying company. In the original dataset, the point density is about 4 points/m².)

The digital twin with LoD2

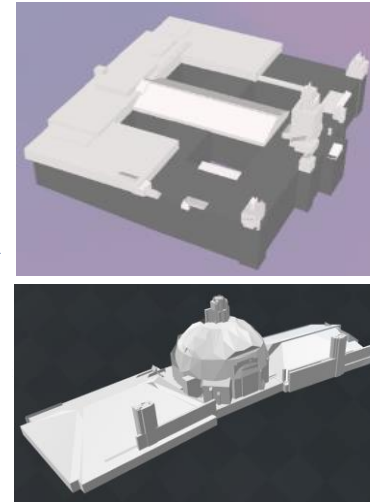
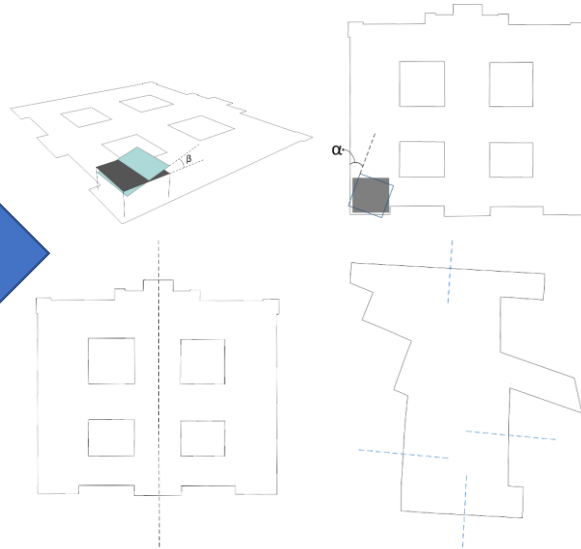
(Buildings have differentiated roof structures and thematically differentiated boundary surfaces)



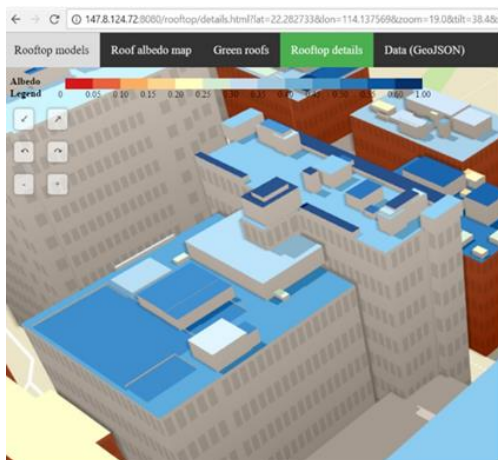
Main Building, HKU (LiDAR / iBI1000)



HHY Building, HKU (UAV)
(Dense point cloud: 482,404 points)



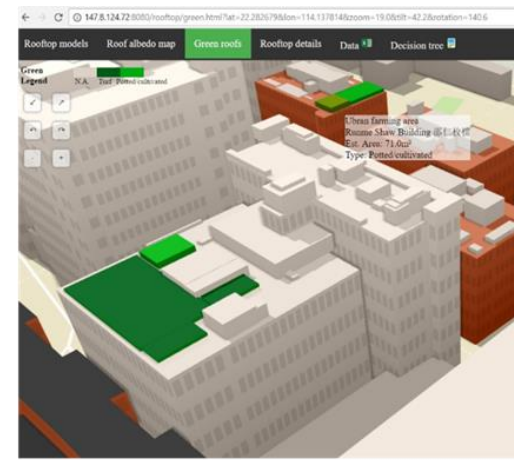
(Data formats: COLLADA, Las, csv)



Generated rooftop
objects from point clouds



Developed albedo map

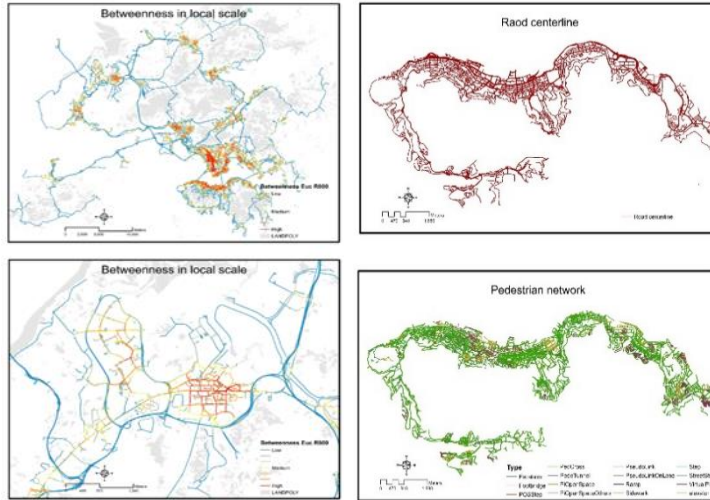


Identified green roof areas
by machine learning

- ❑ Green roof prediction (by Machine Learning)
- ❑ “Edible roof”, urban farming
- ❑ Unauthorised Building Works
- ❑ Rooftops for social functions

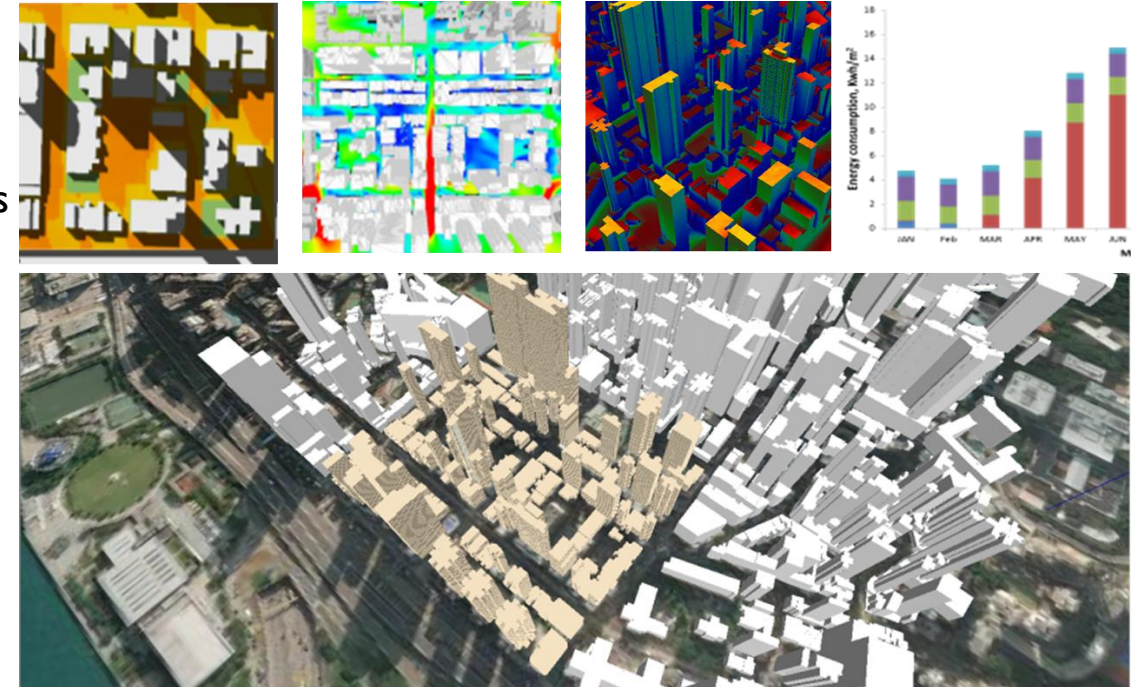
Digital twins and smart city applications

INTERDISCIPLINARY
QUICK
TALKS



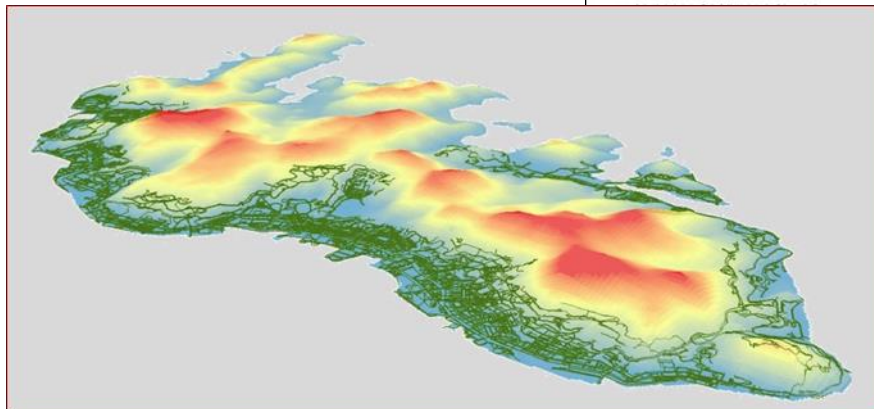
SPPR project: Strategies for Enhancing Walkability in Hong Kong via Smart Policies

Amount: HK\$3.5m
Co-PI: Mr. Alain Chiaradia (FoA, HKU)



2 Digitization of 2D Pedestrian Network 二維步行網絡數字化

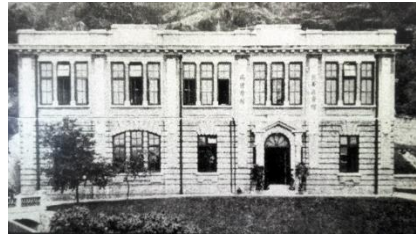
(12) Examples of complicated cases and solutions 例18



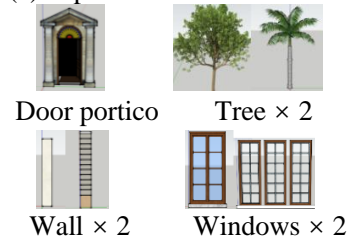
Application of CityComfort+ Software in URA's redevelopment project

Amount: HK\$0.7m
PI: Dr Jiangxiang Huang (FoA, HKU)

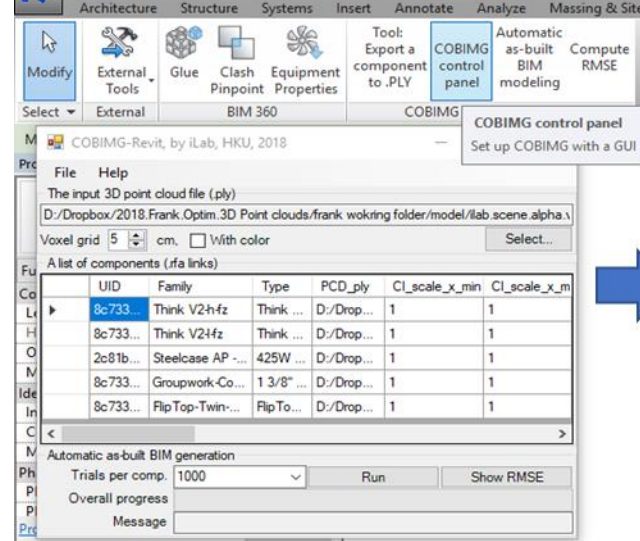
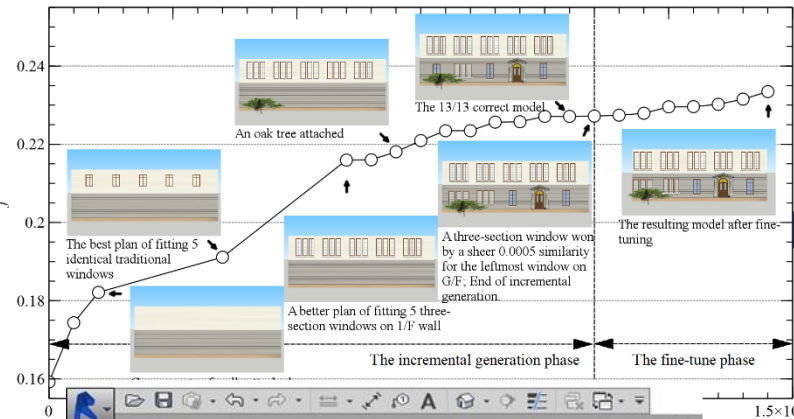
The digital twin with LoD3 and 4



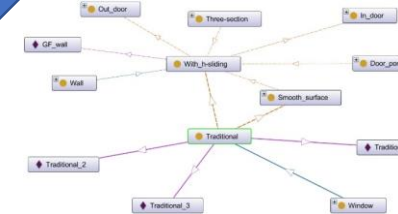
(a) A photo of a demolished building



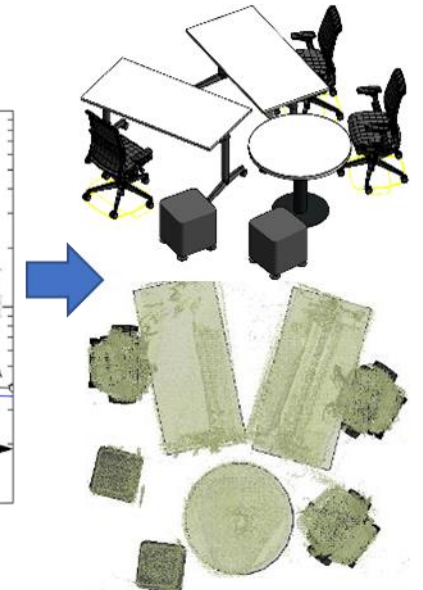
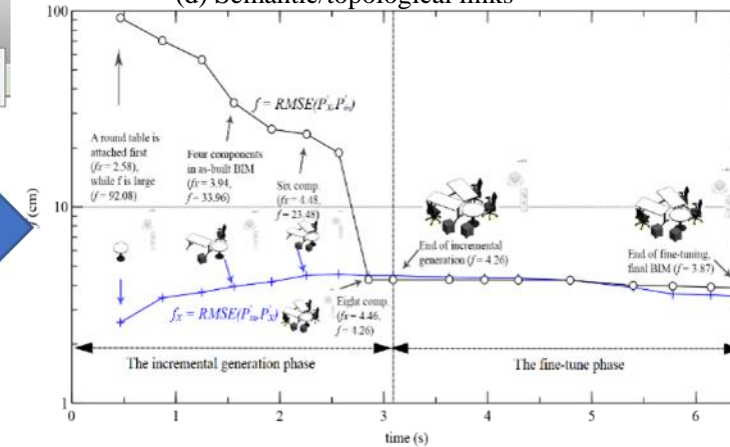
(b) Semantic components from web



(c) Approximate building mode



(d) Semantic/topological links



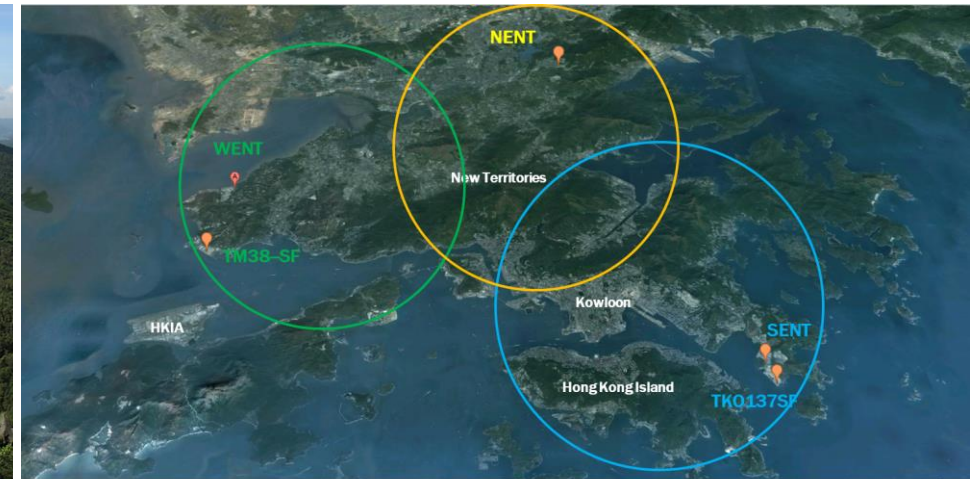
(Language: C++, CLR; Data formats: Autodesk Revit, Stanford polygon)

Identification of Illegal Dumping of Construction Waste Using Urban Big Data

“Construction waste” means any substance, matter or thing which is generated as a result of construction work and abandoned whether or not it has been processed or stockpiled before being abandoned. It is a mixture of surplus materials arising from site clearance, excavation, construction, refurbishment, renovation, demolition and road works (HKEPD, 2017).

In Hong Kong, **inert construction waste (inorganic, 惰性)** consists of materials such as debris, rubble, earth, bitumen and concrete,

while **non-inert waste comprises (organic, 非惰性)** mainly bamboo, plastics, glass, wood, paper, vegetation and other organic materials that are generated from construction, renovation, and demolition activities (HKEPD, 1998).



Landfill ● WENT - West New Territories Landfill
SENT - South East New Territories Landfill
NENT - North East New Territories Landfill

RTS ■ IETS - Island East Transfer Station⁽¹⁾
IWTS - Island West Transfer Station⁽¹⁾
WKTS - West Kowloon Transfer Station⁽¹⁾
OITS - Outlying Islands Transfer Facilities⁽¹⁾
NLTS - North Lantau Transfer Station⁽¹⁾
STTS - Sha Tin Transfer Station⁽²⁾
NWNTRTS - North West New Territories Refuse Transfer Station⁽³⁾
KBTS - Kowloon Bay Transfer Station⁽⁴⁾

Identification of Illegal Dumping of Construction Waste Using Urban Big Data

Illegal dumping, sometimes called fly-tipping, is a criminal offence defined in various ways in different jurisdictions.

Illegal dumping is a human health concern, and can

Fly-tipped waste causes pollution, habitat destruction and underground water pollution.

It also causes aesthetic damage to the natural landscape.



PRESS RELEASE

Ombudsman seeks public views and information on Government's control over landfilling and fly-tipping activities on private land

The Ombudsman, Ms Connie Lau, today (November 16) invited members of the public to provide views and information on how the Environmental Protection Department ("EPD"), the Planning Department ("Plan D") and the Agriculture, Fisheries and Conservation Department ("AFCD") control landfilling and fly-tipping activities on private land.

Presently, the three departments have the following roles: EPD enforces the Waste Disposal Ordinance and other environmental protection laws to tackle acts of dumping of wastes on private land that do not have the consent of all the owners of the land as well as any related environmental problems; Plan D takes enforcement actions under the Town Planning Ordinance against unauthorised landfilling activities in the Development Permission Areas; while AFCD, according to the circumstances, incorporates enclaves by phases into country parks for better protection of those sites.

In recent years, there have been frequent occurrences of illegal landfilling and fly-tipping activities. Even though actions were taken by the departments concerned, those actions were criticised as futile and ineffective by different sectors of the community.

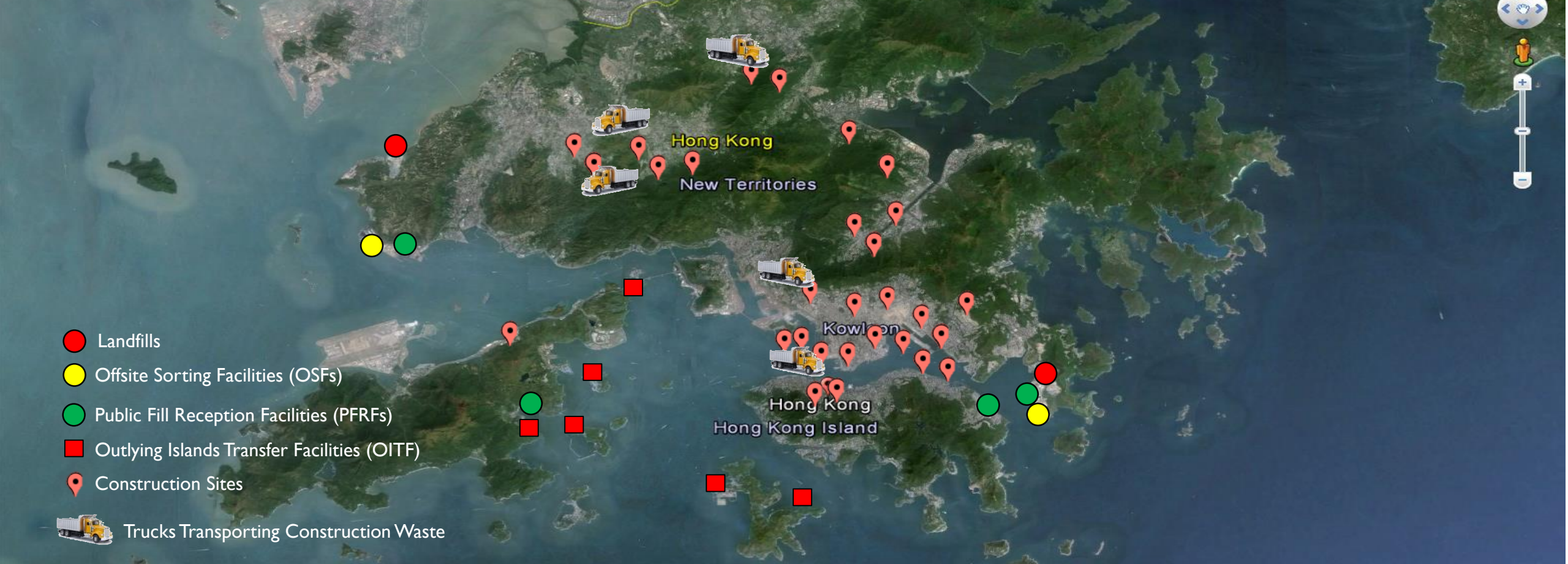
The Ombudsman has, therefore, decided to initiate a direct investigation against EPD, Plan D and AFCD. The ambit of the investigation covers the powers, responsibilities, mechanisms and procedures of those departments regarding the control of landfilling and fly-tipping activities on private land. Her Office will also examine the departments' enforcement actions and their outcomes. The aim is to identify inadequacies in the current legal framework, system and enforcement regime.

CHAPTER 4

Environmental Protection Department Civil Engineering and Development Department

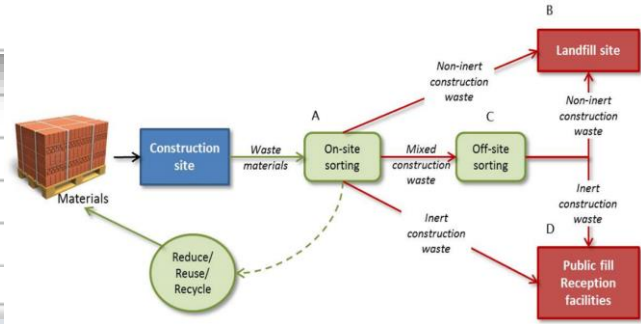
Management of abandoned construction and demolition materials

Audit Commission
Hong Kong
28 October 2016

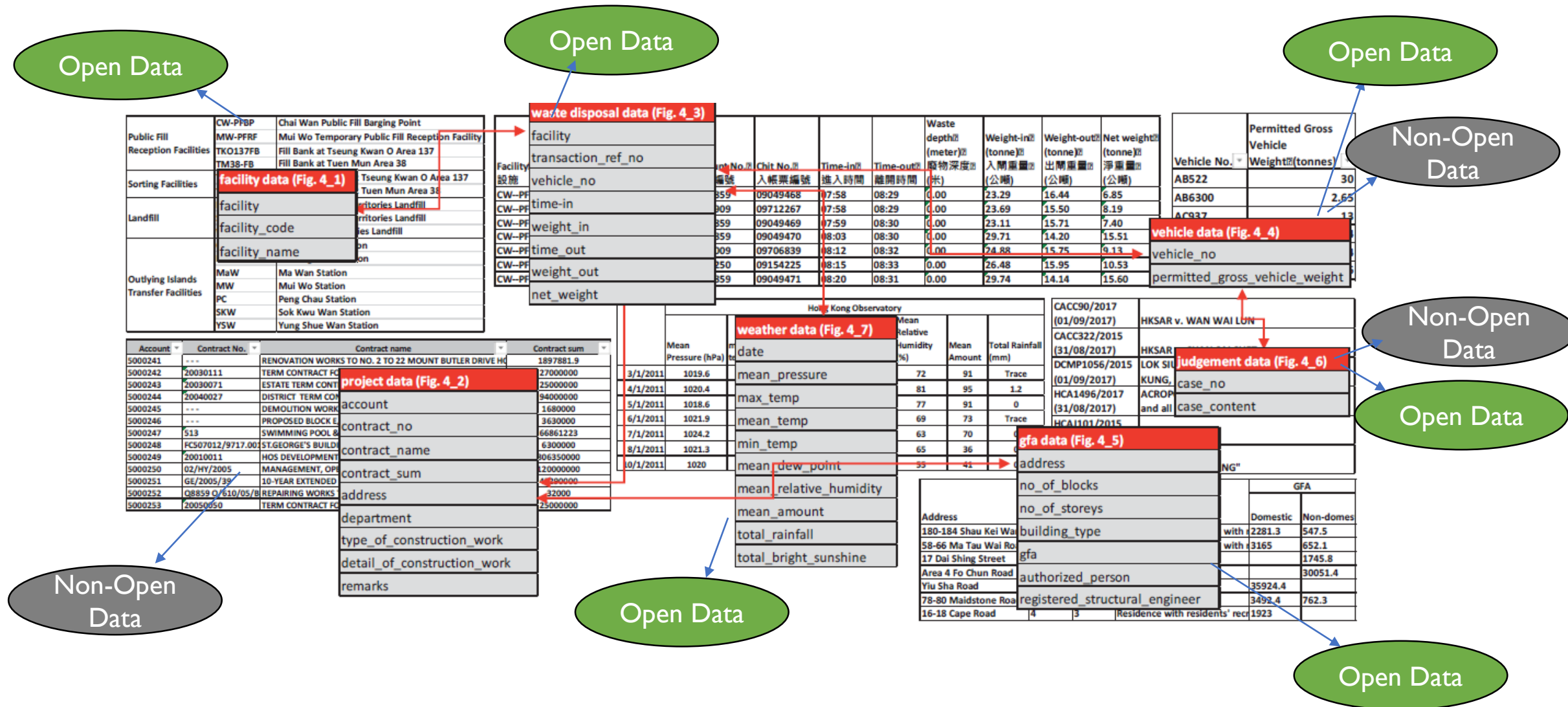


Facility 設施	Date of transaction 交易日期	Vehicle No. 車牌號碼	Account No. 帳戶編號	Chit No. 入帳票編號	Time-in 進入時間	Time-out 離開時間	Waste depth (meter) 廢物深度 (米)	Weight-in (tonne) 入閘重量 (公噸)	Weight-out (tonne) 出閘重量 (公噸)	Net weight (tonne) 淨重量 (公噸)
MW--PFRF	12/08/14	GU1*75	7016041	11028274	13:08	13:10	0.00	21.68	12.42	9.26
MW--PFRF	12/08/14	GU9*62	7016041	11290020	13:12	13:14	0.00	21.90	12.35	9.55
MW--PFRF	12/08/14	FY2*6	7006832	11884164	13:56	14:00	0.00	24.77	14.04	10.73
MW--PFRF	12/08/14	JG8*5	7015857	12247378	14:10	14:13	0.00	22.44	14.70	7.74
MW--PFRF	12/08/14	PG3*20	7013729	11068891	15:58	16:01	0.00	21.20	11.86	9.34
SENT	12/08/14	PW8*6	7012859	12164850	08:05	08:23	0.77	17.13	15.55	1.58
REMARKS CW-PFBP MW-PFRF TKO137FB TM38-FB TKO137SF TM38-SF NENT SENT WENT OITF										

There were around 1.1 million records of this kind in a single year!



The big data

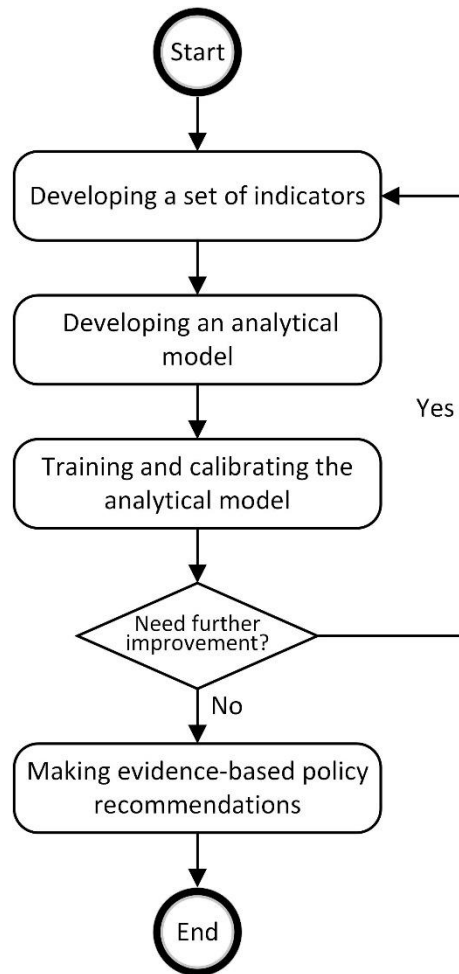


The big data analytics

INTERDISCIPLINARY
QUICK
TALKS

Facility	Date of transaction	Vehicle No.	Account No.	Chit No.	Time-in	Time-out	Waste depth (meter)	Weight-in (tonne)	Weight-out (tonne)	Net weight (tonne)
設施	交易日期	車牌號碼	帳戶編號	人帳票編號	進入時間	離開時間		入關重量	出關重量	淨重量
CW--PF8P	2/7/2015	DN3*9	7020360	13617925	7:58	8:29	0	24.7	12.5	12.2
CW--PF8P	2/7/2015	SZ6*41	7012721	13825773	7:58	8:29	0	30.87	13.95	16.92
CW--PF8P	2/7/2015	JJ7*32	7021280	13695984	7:59	8:30	0	23.57	12.52	11.05
CW--PF8P	2/7/2015	NP1*71	7020360	13617926	8:00	8:30	0	31.23	14.13	17.1
CW--PF8P	2/7/2015	PD5*82	7012721	13825774	8:00	8:31	0	30.77	14.23	16.54
CW--PF8P	2/7/2015	RP8*20	7013338	12823592	8:00	8:32	0	22.85	15.51	7.34
CW--PF8P	2/7/2015	LK7*43	7000588	13741517	8:01	8:33	0	8.68	7.37	1.31
CW--PF8P	2/7/2015	RY7*94	7019382	12813091	8:01	8:32	0	24.72	14.04	15.68
CW--PF8P	2/7/2015	RG2*53	7011027	13803145	8:01	8:40	0	25.8	17.93	7.87
CW--PF8P	2/7/2015	LT7*42	7021280	13695985	8:01	8:32	0	20.93	12.75	8.18
CW--PF8P	2/7/2015	RY6*61	7019382	12813092	8:02	8:34	0	29.89	14.07	15.82
CW--PF8P	2/7/2015	PT2*90	7000588	13292310	8:04	8:34	0	4.93	3.25	1.68
CW--PF8P	2/7/2015	ES8*9	7020360	13617927	8:05	8:34	0	24.97	12.29	12.68
CW--PF8P	2/7/2015	LG3*03	7013338	12823593	8:07	8:35	0	19.84	12.05	7.79
CW--PF8P	2/7/2015	RL1*93	7021280	13695986	8:12	8:36	0	23.54	12.2	11.34
CW--PF8P	2/7/2015	LH9*72	7020360	13617928	8:14	8:36	0	24.91	12.49	12.42
CW--PF8P	2/7/2015	NG7*20	7020360	13617929	8:17	8:37	0	24.5	12.33	12.17
CW--PF8P	2/7/2015	TA9*45	7021185	13775742	8:19	8:37	0	31.09	13.84	17.25
CW--PF8P	2/7/2015	KP8*75	7019231	11655168	8:21	8:38	0	24.8	12.36	12.44
CW--PF8P	2/7/2015	NZ2*10	7016150	13646899	8:22	8:39	0	22.5	13.85	8.65
CW--PF8P	2/7/2015	MT8*66	7021475	13313714	8:23	8:39	0	23.72	12.08	11.64
CW--PF8P	2/7/2015	SB8*6	7019703	12033859	8:24	8:42	0	24.59	15.81	8.78
CW--PF8P	2/7/2015	ME8*22	7021185	13775743	8:26	8:41	0	30.77	14.34	16.43
CW--PF8P	2/7/2015	PB8*08	7018623	13915358	8:27	8:41	0	30.2	14.07	16.13
CW--PF8P	2/7/2015	TH6*72	7013338	12823682	8:32	8:43	0	22.03	15.08	6.95
CW--PF8P	2/7/2015	SL9*40	7021581	13582657	8:33	8:42	0	23.88	11.55	12.33
CW--PF8P	2/7/2015	FC3*95	7021185	13775744	8:34	8:43	0	30.89	14.51	16.38
CW--PF8P	2/7/2015	NP6	7018623	13915359	8:35	8:45	0	38.78	17.18	21.6
CW--PF8P	2/7/2015	LJ6*95	7019322	11738675	8:36	8:44	0	24.18	12.54	11.64
CW--PF8P	2/7/2015	JM6*	7017985	12385014	8:37	8:45	0	31.29	13.68	17.61
CW--PF8P	2/7/2015	RP9*5	7021475	13313715	8:38	8:46	0	22.54	11.91	10.63
CW--PF8P	2/7/2015	TK8*56	7013270	13814406	8:38	8:44	0	22.98	14.41	8.57
CW--PF8P	2/7/2015	EE1*62	7007657	13725134	8:40	8:47	0	24.15	15.61	8.54
CW--PF8P	2/7/2015	KE3	7018623	13915360	8:41	8:49	0	37.75	16.85	20.9
CW--PF8P	2/7/2015	DZ1*53	7019231	11655169	8:41	8:47	0	24.32	12.48	11.84
CW--PF8P	2/7/2015	MT1*60	7017548	13139513	8:41	8:47	0	24.01	12.61	11.4
CW--PF8P	2/7/2015	LUS*88	7019322	11738676	8:42	8:50	0	24.08	12.52	11.56

The big data analytics



Step 1: To characterize illegal dumping behaviors and develop a set of indicators that can predict illegal dumping behavior

Step 2: To develop an analytical model based on the identified indicators

Step 3: Training and calibrating the analytical model using **known offense cases**

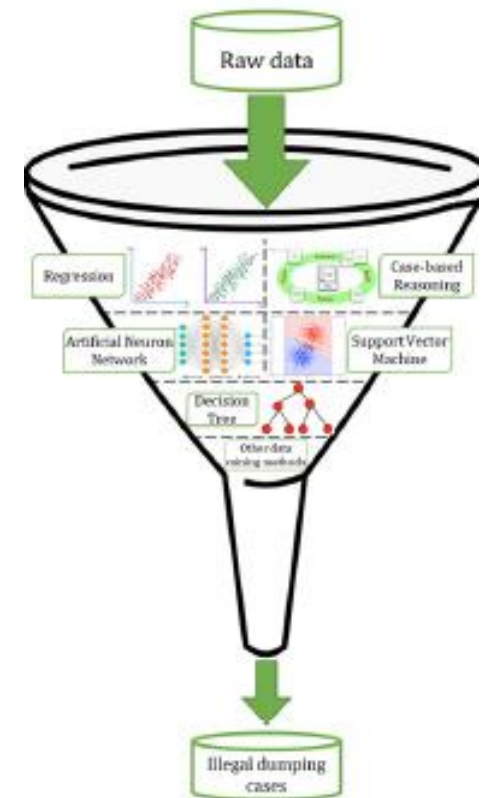
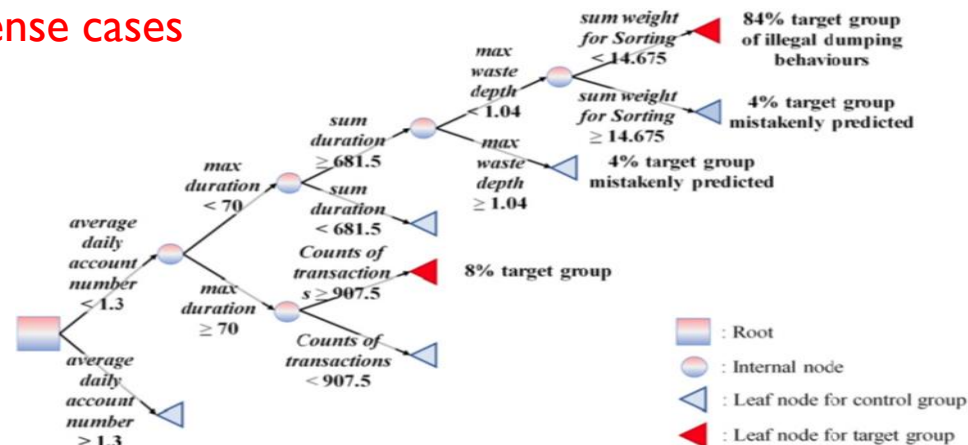


Fig. 6 An illustration of the "Illegal Dumpine Filter" (IDF)

The Government Policy Innovation and Co-Ordination Office (PICO) Public Policy Research (PPR) Funding Scheme 2018-19

Project Title: "Finding the Needles in a Haystack": Identification of the Illegal Dumping of Construction Waste Using Big Data. HK\$ 447,350. 18 Months. PI.

Desire for open big data

Legal Reference System
法律參考資料系統

繁體 簡體 A A A RSS

Search by Neutral Citation Number

Search

Home

Judgments

Press Summaries on CFA Judgments

Reasons for Verdict

Reasons for Sentence

Practice Directions

Miscellaneous

Newly Added Judgments

New Practice Directions

Help

Contact Us

W3C WAI-AA WCAG 2.0

Newly Added Judgments

Upload date: 12/02/2019 (Tue)

Case Number	Case Name
CACV445/2018 [2019] HKCA 99 (04/02/2019)	RE IQBAL MOHAMMAD ASIF
DCEC7/2017 [2019] HKDC 124 (08/02/2019)	TSUI CHI HUNG TONY 對 YIP WAI MING t/a TAK CHEONG PLASTIC MATERIALS FACTORY
HCAL217/2019 [2019] HKCFI 247 (08/02/2019)	黎奇峰 對 律政司司長
HCAL858/2018 [2019] HKCFI 301 (11/02/2019)	CHAN YIU WING v. COMMISSIONER OF INLAND REVENUE

Judgments in Word format uploaded on the website you cannot open the judgments in Word format, p

Two fined HK\$15k each for illegally dumping construction waste in protected Hong Kong wetland

4 August 2016 14:54 · Gene Lin · 2 min read



Two individuals have been convicted of violating the Waste Disposal Ordinance on Wednesday after illegally dumping construction waste in protected wetland at Tsim Bei Tsui, New Territories last year.

Prosecution estimated that around 1 hectare of wetland and mangrove forest had been affected by the illegal dumping. The Environmental Protection Department said that part of the wetland has been dug up and filled with spackling paste, which can kill the mangrove trees. The department estimated the repair cost to be at HK\$6 million.

Transport Department
The Government of the Hong Kong Special Administrative Region

GovHK 香港政府一站通 繁體版 簡體版

SITE MAP

Live Webcast of Road Traffic Condition

Kowloon

For PC user, Flash plugin is required to view this webcast. [setting]

- K107F Cross Harbour Tunnel Kowloon Side
- K109F Chatham Road near Princess Margaret Road
- K502F Waterloo Road / Cornwall Street
- K409F Princess Margaret Road / Argyle Street
- K614F Lung Cheung Road / Clear Water Bay Road

Available Unavailable

Snapshot Home

Links to Further Information

Construction Waste Statistics in Hong Kong <https://www.epd.gov.hk/epd/misc/cdm/trip.htm>

Transaction Records of Construction Waste Disposal at Government Waste Disposal Facilities
<https://www.epd.gov.hk/epd/misc/cdm/scheme.htm#j>

Monthly Digests of Buildings Department - Detailed information - Completed new buildings for which occupation permits have been issued <https://data.gov.hk/en-data/dataset/hk-bd-md-monthly-digests-of-buildings-department-md56>

Legal Reference System <https://legalref.judiciary.hk/lrs/common/ju/newjudgments.jsp>

The Cambridge Big Data Initiative <https://www.bigdata.cam.ac.uk/>

THANK YOU

