Online Codebook

AI Enabled Transport for Kuwait's 2035 Roadmap: Bridging the Tech–Policy Gap vis à vis the UAE and Singapore

Dataset version: v6.5

Scope: Applies to strategic and legislative documents, semi structured interviews, and analytic artifacts, Technology–Policy Readiness Matrix, TPRM, scores, Transferability Boxes, and scenario notes.
Unit of coding: the smallest segment that supports a single code, typically a sentence for documents and one to three sentences for interviews.
General rule: code narrowly, add a memo when uncertain, resolve disagreements in reconciliation with a target quadratic weighted Cohen's kappa of at least 0.80.

Abbreviations at first mention in this codebook: Technology–Policy Readiness Matrix (TPRM), Technology Readiness Level (TRL), Policy Readiness Level (PRL), application programming interface (API), key performance indicator (KPI), autonomous vehicle (AV), Mobility as a Service (MaaS), Computer Vision Incident Management (CVIM), electric vertical take off and landing (eVTOL), urban air mobility (UAM).

0) How to use this codebook

- **What this is:** the authoritative data dictionary and code definitions for all fields and codes used in the study.
- **What this is not:** it is not the place for the methods narrative or the full documentary corpus, see the Online Appendix.
- **Coder priority:** apply inclusion and exclusion rules first. When in doubt, log a memo and choose the more conservative rung or code.

1) Case and source attributes, data dictionary

Use these attributes to classify each source or segment before thematic coding. Extend enumerations only through the change log in Section 8.

Field	Type	Allowed values or examples	Required	Notes
Jurisdiction	enum	Kuwait, UAE-RTA, Singapore-LTA	✓	Use these slugs for joins and plots
Source_Type	enum	Doc-Law/Decree, Doc-Strategy/Policy, Doc-ExecReg/Guideline, Doc-Tender/Contract, Doc-Report/Study, Interview-Official, Interview-SOEManager, Interview-Academic	✓	Choose the most authoritative type present
Year	int (YYYY)	2014 to 2025	✓	Gazette or publication year
Agency	enum+	MOTC, CAIT, CITRA, CAPT, RTA, LTA		Keep canonical names

Field	Type	Allowed values or examples	Required	Notes
Mode_Domain	enum	Road, Rail/Metro, Bus, AV Shuttle, eVTOL/UAM, Freight/Logistics, MaaS/Data, Traffic Mgmt	✓	Dominant domain for the segment
Initiative_ID	string	JUR_Type_XX, for example KWT_ASC_01		Persistent slug, see Section 7
Evidence_Reliability	enum	High, official or legal; Medium, agency report; Low, media or marketing	✓	Drives confidence flags
Language	enum	EN, AR	✓	If AR, set Translation_Flag=Y
Translation_Flag	bool	Y or N		Y if translated, note translator context in memo if relevant
Collected_On	date	Day Month Year		Optional, improves auditability

2) Thematic code hierarchy, families A to I

Co apply codes when a segment substantively supports more than one theme. For each subcode list: definition, include, exclude, typical evidence.

A. Policy instruments and governance

- **A1_Law/Regulation:** binding laws, decrees, mandatory standards.
  Include enacted laws and regulations, gazetted standards, binding ministerial decisions. Exclude drafts without force and non-binding strategies. Typical evidence is an official gazette or a statute portal.
- **A2_Guideline/Standard:** non-binding technical or operational guidance.
  Include test protocols, KPI manuals, technical references. Exclude binding standards.
- **A3_Strategy/Program:** vision documents, roadmaps, program charters.
  Include national AI strategies, ITS strategies, agency AI roadmaps.
- **A4_Institutional Capacity:** units, staffing, budgets, training, SOPs.
  Include creation of a unit, budget lines, training programs, SOP issuance. Exclude aspirational mentions without allocation.
- **A5_Coordination Mechanism:** interagency committees, one stop windows, memoranda of understanding.
  Include a single window mandate or formal memoranda with service levels.
- **A6_Enforcement Mechanism:** permits, inspections, penalties, audits, certification.
  Include permit issuance, audits performed, penalties applied. Exclude unenforced statements.
- **A7_Public Engagement/Trust:** consultations, transparency portals, user acceptance initiatives.
  Include public dashboards, consultation reports, trust or acceptance campaigns.

B. Financing and procurement

- **B1_Funding Source:** treasury, public private partnership, international financial institution loan, grants, private capital expenditure.
- **B2_Procurement Model:** public private partnership, design build, outcome based contracting, innovation partnership.
- **B3_Cost Recovery/Tariffs:** fares, charges, data monetization models.

C. Data and digital infrastructure

- **C1_Data Sharing/Access:** APIs, open data policies, one stop portals, access tiers.
- **C2_Privacy/Protection:** personal data duties, anonymization, consent models.
- **C3_Cybersecurity/Resilience:** controls, incident response, critical infrastructure posture.
- **C4_Standards/Interoperability:** GTFS RT, ISO, ETSI, national schemas.
- **C5_Digital Twin/Control Center:** advanced traffic management systems, traffic management centers, city digital twins.

D. Safety, liability, and ethics

- **D1_Safety Cases/Testing:** operational design domain, test permits, safety cases, incident reporting.
- **D2_Liability/Insurance:** fault allocation, mandatory insurance, indemnities.
- **D3_Ethics/Equity/Accessibility:** inclusion, accessibility provisions, algorithmic fairness.

E. Implementation status

- **E1_Pilot/Trial:** limited operational design domain, time bound pilots.
- **E2_Pre-Commercial/Scaling:** multi site expansion, pre-revenue service.
- **E3_Commercial Operation:** routinely available service with KPI reporting.
- **E4_Stalled/Cancelled:** specify legal, funding, technical, or social reasons.

F. AI mobility initiative taxonomy

- **F1_Adaptive Signal Control (ASC)**
- **F2_AV Shuttle/Buses, L3 to L4**
- **F3_Mobility as a Service (MaaS) and integrated ticketing**
- **F4_eVTOL/UAM**
- **F5_Incident Detection/Computer Vision (CVIM)**
- **F6_Predictive Maintenance**
- **F7_Logistics/Smart Freight**
- **F8_Traffic Management Platform, TMS or ATMS**

G. Outcomes and KPIs

- **G1_Safety:** crashes, fatalities, injuries.

- **G2_Congestion/Travel Time:** average speed, delay, travel time index.
- **G3_Reliability/Punctuality:** on time performance, headway adherence.
- **G4_Emissions/Energy:** carbon dioxide, energy intensity.
- **G5_Ridership/Mode Share:** public transport share, trip counts.
- **G6_Cost Efficiency:** operating or capital expenditure per kilometre or passenger.

H. Barriers and enablers, capacity view

- **H1_Analytical Capacity:** data, tools, skills.
- **H2_Operational Capacity:** processes, IT systems, staffing.
- **H3_Political Capacity:** leadership, stakeholder alignment.
- **H4_Legal Gap:** missing or unclear rules, conflicts.
- **H5_Market Readiness:** vendor maturity, supply chain.
- **H6_Social Acceptance:** public trust, adoption barriers.

I. Transferability, source cases to Kuwait

- **I1_Directly Portable to Kuwait**
- **I2_Adapt Required**
- **I3_Non-Transferable**

Coding note: if a segment describes a policy instrument, A codes, and its rollout stage, E codes, apply both.

3) TPRM scoring variables and logic

Attach one TRL and one PRL score to each initiative, both must satisfy the two source rule.

TRL_Score, enumeration

- TRL1 Basic principles observed
- TRL2 Concept formulated
- TRL3 Proof of concept demonstrated, lab or simulation
- TRL4 Technology validated in lab
- TRL5 Technology validated in relevant environment
- TRL6 System or subsystem demonstrated in relevant environment
- TRL7 System prototype demonstrated in operational environment
  Anchor: AV shuttles carrying passengers on a fixed corridor under permit.
- TRL8 System completed and qualified
- TRL9 Actual system proven in operational use
  Anchor: city wide adaptive signals controlling greater than 80 per cent of junctions with KPI reporting.

PRL_Score, enumeration

- PRL1 Problem recognition, agenda surfacing
- PRL2 Agenda setting
- PRL3 Strategy articulation
- PRL4 Policy design, cabinet or executive approval
- PRL5 Legislation drafted, circulated or in committee
- PRL6 Legislation enacted, gazetted
- PRL7 Institutions and budgets allocated, units staffed, SOPs
- PRL8 Operational enforcement, permits, audits, sanctions applied
- PRL9 Routinized practice and evaluation, annual reviews and KPI linked adjustments
  Evidence cues: PRL5 draft bill on record, PRL7 a dedicated AV office with a budget, PRL8 active permit issuance and audits.

Gap metrics

- Gap_Abs equals the absolute difference
- Gap_Tier equals Green, Amber, or Red, derived from |TRL–PRL| where Green is less than or equal to one, Amber is two to three, Red is four or higher.

Confidence

- Confidence equals H, M, or L.
  High is more than two primary official sources, Medium is exactly two independent sources, Low is a single official source or an item in flux. Report the lower of TRL and PRL confidence for the initiative.

4) Extraction form schema, authoritative

Field	Type	Allowed values or format	Required	Notes
Initiative_ID	string	JUR_Type_XX	✓	Unique
Jurisdiction	enum	Kuwait, UAE-RTA, Singapore-LTA	✓	
Initiative_Type	enum	F1 to F8, primary, optional secondary	✓	Map from Section 2F
Description	text	Neutral one to two sentences	✓	No evaluation language
TRL_Score	enum	TRL1 to TRL9	✓	Cite in Evidence_1 and Evidence_2
PRL_Score	enum	PRL1 to PRL9	✓	Service layer focus
Gap_Abs	int	auto	✓	
Gap_Tier	enum	Green, Amber, Red	✓	Derived

Field	Type	Allowed values or format	Required	Notes
Policy_Instruments	list	A codes present		
Enforcement	text	A6 notes, permits or audits		
Funding_Procurement	list	B1 to B3 values		
Data_Governance	list	C codes present		
Safety_Liability	list	D codes present		
Implementation_Status	enum	E1 to E4	✓	
KPIs	list	G codes plus units, for example “G2: min per 10 km”		
Barriers_Enablers	list	H codes		
Transferability	enum	I1, I2, or I3, source cases only		
Evidence_1	citation	Document ID or stable link	✓	See corpus in Appendix
Evidence_2	citation	Independent second source	✓	Interview allowed only in Kuwait
Confidence	enum	H, M, L	✓	Lower of TRL or PRL
Coder_A and Coder_B	initials	A to Z	✓	
Adjudication_Note	text	Short rationale and log ref		
Memos	link	Memo IDs		

CSV header template:

Initiative_ID,Jurisdiction,Initiative_Type,Description,TRL_Score,PRL_Score,Gap_Abs,Gap_Tier,Policy_Instruments,Enforcement,Funding_Procurement,Data_Governance,Safety_Liability,Implementation_Status,KPIs,Barriers_Enablers,Transferability,Evidence_1,Evidence_2,Confidence,Coder_A,Coder_B,Adjudication_Note,Memos

5) Inclusion and exclusion rules

- Code intent, not rhetoric. Announcements or promises stay at PRL3 unless instruments are drafted or enacted.
- Prefer primary sources. Do not raise PRL above 6 without a gazette or a formal instrument.
- Marketing is not operation. Do not assign TRL9 without operational KPI evidence.
- Multi coding is allowed if each code is independently supported.

- Interviews may only pair with an official document in Kuwait to satisfy the two source rule, interviews never determine a score alone.
- When in doubt, use the lower rung and add a memo.

6) De-identified exemplars, usage guidance

No direct quotes are required in this public codebook. If exemplars are shared, ensure they are de-identified and, if needed, placed under restricted access.

Illustrative mappings:

- "By Decree 17 of 2025 the Authority establishes an AV permitting regime with quarterly safety audits." Map to A1_Law/Regulation, A6_Enforcement Mechanism, D1_Safety Cases/Testing, PRL8 if permits are issued, PRL6 if enacted but not yet active.
- "We run twelve autonomous shuttle trips per hour, passenger counts are reported weekly to the regulator."
  Map to F2_AV Shuttle/Buses, E2_Pre-Commercial/Scaling, G5_Ridership, likely TRL7 to TRL8 with documentary triangulation.

7) Naming and memo conventions

- **Codes:** Family_Code_Subcode, for example A1_Law/Regulation.
- **Initiatives:** JUR_Type_XX, for example KWT_ASC_01.
- **Memos:** YYYYMMDD_Initials_Topic, for example 20250802_LA_TRL7vs8Rule.
- **Document IDs:** JUR_YYYY_ShortTitle or a stable link aligned to the Appendix corpus table.

8) Coder workflow, reliability, and versioning

1. **Calibration:** each coder labels the same five documents and three interviews, then discuss and refine definitions.
2. **Double coding:** at least 30 per cent of items, compute quadratic weighted kappa per major family, target at least 0.80.
3. **Reconciliation:** log disagreements by date and item, note the clarified rule, adjudicator issues the final score.
4. **Change control:** extend enumerations or adjust definitions only through change log entries, then increment the version, v1.1, v1.2.
5. **Data protection:** keep exemplar quotes de-identified and place them in the restricted area if needed.

Planned machine-readable outputs:
adjudication_log.csv, reconciliation_log.csv, kappa_inputs_wide.csv.

9) Template schemas, machine-readable blanks

9.1 Transferability Box

Field	Description
Lever_Practice	Named lever or practice from a source case
Evidence	Citation or citations
Mechanism_WhyItWorks	Mechanism note
Kuwait_Fit	Fit assessment
Class	I1, I2, or I3
Adaptation_Notes	Specific adaptations needed

CSV header:

Lever_Practice,Evidence,Mechanism_WhyItWorks,Kuwait_Fit,Class,Adaptation_Notes

9.2 Scenario Mapping, feeds manuscript scenarios

Field	Description
Scenario	Managed Transition, Accelerated Innovation, or Policy Lag
Trigger_Gaps	Gap_Tier drivers
PRL_Sequence_Required	Ordered PRL steps
TRL_Actions_Unlocked	Actions contingent on PRL
Risks_Mitigations	Key risks and controls
Milestones_Year	Year stamped milestones

CSV header:

Scenario,Trigger_Gaps,PRL_Sequence_Required,TRL_Actions_Unlocked,Risks_Mitigations,Milestones_Year

Placement note: rendered scenario panels are not part of the codebook. See the Online Appendix, Section E.

9.3 TPRM scoring sheet, authoritative CSV header

Initiative_ID,Jurisdiction,Initiative_Type,Description,TRL_Score,PRL_Score,Gap_Abs,Gap_Tier,Policy_Instruments,Enforcement,Funding_Procurement,Data_Governance,Safety_Liability,Implementation_Status,KPIs,Barriers_Enablers,Transferability,Evidence_1,Evidence_2,Confidence,Coder_A,Coder_B,Adjudication_Note,Memos

10) Machine-readable exports to publish with this PDF

- codebook_codes.csv with columns code_id,parent_id,family,code,definition.
- data_dictionary_TPRM.csv with columns field,type,allowed_values,required,description.
- extraction_form_template.csv using the header in Section 4.
- transferability_box_template.csv and scenario_mapping_template.csv using the headers in Section 9.
- Optional examples_deidentified.csv keyed by code_id if shareable under restrictions.

11) Cross-references and cutoff

- **Cutoff:** all rules and enumerations reflect materials available up to 31 December 2025.
- **Sources:** the full documentary corpus appears in the Online Appendix and as documents_catalog.csv.
- **Methods and figures:** κ results, TF–IDF specification, TPRM ladders, and rendered scenario panels are in the Online Appendix. Panels are in Section E.

12) Licenses

- Code and scripts use MIT or Apache-2.0, see repository LICENSE.
- This codebook uses CC BY 4.0.
- Human subjects derivatives, if any exemplars, are under restricted use with no re identification and no redistribution.

13) Version history, blinded

Version	Date	Changes	Editor
v1.0	31 December 2025	Initial public draft aligned to Appendix, schemas and enumerations finalized	Blinded