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Amman Green City Action Plan

Greater Amman Municipality and European Bank for Reconstruction
and Development

FINAL DRAFT
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Prepared by:

AECOM

AECOM Limited
Aldgate Tower
2 Leman Street
London E1 8FA
United Kingdom
aecom.com

Prepared in association with:

Mostaqbal Engineering and Environmental Consultants
Leaders of Tomorrow

Jordan Green Building Council

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Table of Contents

1.1	إنشاء منشأة لنقل نفايات من خلال	Error! Bookmark not defined.
1.2	التدوير وإعادة برنامج وإنشاء النظيفة المواد لاستعادة مرفق إنشاء	Error! Bookmark not defined.
2.	Introduction	24
2.1	Overview and Purpose of GCAP	24
2.2	How to read this document	24
2.3	Spatial Coverage of the GCAP	25
3.	The GCAP Process for Amman	27
3.1	GCAP Governance	29
3.2	Vision	29
4.	Stakeholder and Public Engagement in Amman	30
4.1	Stakeholder Engagement Process	30
4.2	Public Engagement Process	34
4.2.1	Phase 1: Public Engagement Plan	34
4.2.2	Phase 2: City-wide engagement activities	44
5.	Summary of City and Environmental Context	46
5.1	City Context	46
5.2	Governance Context Relevant to the GCAP	46
5.3	Environmental Baseline of Amman	50
5.3.1	Development of Priority Environmental Challenges	51
5.3.2	Existing Plans and Projects	52
6.	Green City Actions for Amman	55
6.1	Efficient and resilient energy systems and buildings	59
6.2	Accessible, diverse and low-carbon mobility systems	71
6.3	Resource efficient and holistic waste management systems	83
6.4	Integrated water resources management	94
6.5	Comprehensive and reflective land-use planning	104
6.6	Responsive and forward-looking climate adaptation practices	115
7.	Monitoring our Progress and Impact	119
7.1	Monitoring Progress	119
7.1.1	Project Management Plan	119
7.1.2	Impact Monitoring Plan	120
7.1.3	Sharing lessons learned	121
7.1.4	Improving baseline data	121
	Appendix A Baseline Conditions in Amman	123
A.1	Social, economic and institutional context	123
A.2	State of and key pressures on environmental conditions in Amman	123
	Appendix B Co-benefits Assessment	138
	Efficient and resilient energy systems and buildings	139
	Accessible, diverse and low-carbon transport systems	140
	Integrated water resources management	142
	Comprehensive and reflective land-use planning	143
	Responsive and forward-looking climate adaptation practices	144
	Appendix C CO2 Calculations Assumptions	147
	Appendix D Environmental Indicator Data	148
	Appendix E Long-term actions	159

E.1	Efficient and resilient energy systems and buildings	159
E.2	Accessible, diverse and low-carbon mobility systems.....	162
E.3	Resource efficient and holistic waste management systems	166
E.4	Integrated water resources management	169
E.6	Comprehensive and reflective land-use planning	172
E.7	Responsive and forward-looking climate adaptation practices	181

Figures

Figure 1.1. Coverage of this GCAP	26
Figure 2.1. GCAP process	28
Figure 2.2. Existing visions for Amman	29
Figure 2.3 Themes from Amman's existing visions	29
Figure 3.1. Results of the January 2019 online poll	31
Figure 3.2 What does a 'Green City' mean to you?	31
Figure 3.3. Prioritisation Workshop	32
Figure 3.4. FADFED event near Rainbow Street, Amman.....	35
Figure 3.5. FADFED Event Responses.....	36
Figure 3.6. Campaign Mural at Rainbow Street	37
Figure 3.7 Responses from the Public Engagement Online Campaign	40
Figure 4.1. Existing and planned projects in Amman.....	54
Figure 5.1. Action hierarchy.....	57

Tables

Table 3.1. Short-list criteria developed during the July 2019 workshop	33
Table 3.2. SWOT Analysis.....	34
Table 3.3 Contest Winners	41
Table 4.1. Key National Ministries relevant to the GCAP.....	47
Table 4.2. The level of jurisdiction of GAM over key environmental indicators	48
Table 4.3. Priority Environmental Challenges identified for Amman	51
Table 4.4. Key pressures contributing to environmental challenges in Amman	52
Table 4.5. Key Existing Plans and Projects in Amman	52
Table 5.1. Cost Summary for the Amman GCAP Actions	55
Table 5.1. Co-benefits criteria.....	56
Table 5.2 Priority GCAP actions	56
Table 6.1. Roles and responsibilities for monitoring and report on GCAP actions.....	119
Table 6.2. Excerpt of the PMP	120
Table 6.3. Excerpt of the IMP	121

List of Acronyms

Acronym	Definition
AFD	Agence Française de Développement
BRT	Bus rapid transit
CNG	Compressed natural gas
CO ₂	Carbon Dioxide
DGC	Departmental Green Champion
DVLD	Driver and Vehicle Licensing Department
EBRD	European Bank for Reconstruction and Development
EMRC	Energy and Minerals Regulatory Commission
GAM	Greater Amman Municipality
GCAP	Green City Action Plan
GCG	Green City Coordinator
GGGI	Global Green Growth Institute
GHG	Greenhouse gases
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICLEI	International Council of Local Environmental Initiatives
IFI	International Finance Institutions
IMP	Impact monitoring plan
JEPCO	Jordanian Electric Power Company
KoM	Kick-off meeting
LoT	Leaders of Tomorrow
MEMR	Ministry of Energy and Mineral Resources
MGP	Amman Metropolitan Growth Plan
MoEnv	Ministry of Environment
MoT	Ministry of Transport
MWI	Ministry Of Water And Irrigation
NEPCO	National Electric Power Company
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen oxides
OECD	Organisation for Economic Co-operation and Development
PECs	Priority Environmental Challenge
PEP	Public engagement plan
PMP	Progress monitoring plan
PSR	Pressure State Response
RSCN	Royal Society for the Conservation of Nature
WAJ	Water Authority of Jordan
WHO	World Health Organisation
WWTP	Waste Water Transfer Plant

[Hold for Mayor’s Foreword]

FINAL DRAFT

ملخص تنفيذي

المقدمة

تعتبر عمّان مركزاً للثقافة والتجارة في الأردن وفي المنطقة على نطاق واسع. على مدار العقد الماضي، تضاعف عدد سكان عمّان تقريباً ليصل إلى (4.4) مليون نسمة، مما أدى إلى دفع عجلة الاقتصاد والتشجيع على التوسّعات الحضريّة الكبيرة. وقد أدى هذا النمو السكانيّ والتحضرّ المقابل له إلى الضغط على جودة المدن من الناحية البيئيّة، وكان له تأثير على صحة ورفاهية سكّانها. تتضمن هذه العوامل الضغط على توافر المياه، وتنوعية الهواء، وتوافر المساحات الخضراء، وصحة النظم البيئية في المنطقة.

وإدراكاً للحاجة إلى التحوّل نحو المستقبل المُستدام، فقد قامت أمانة عمّان الكبرى بتطوير وإعداد مجموعة من الخطط على مدار السنوات العديدة الماضية، لمواجهة هذه التحديات وتحسين جودة ونوعية الحياة في الوقت ذاته لسكان عمّان. تتضمن هذه الخطط والاستراتيجيات استراتيجية عمّان للصمود، وخطة العمل المناخي، والأعمال المستمرة التي يقوم بها المعهد العالمي للنمو الأخضر GGGI لوضع خطة عمل وطنية للنمو الأخضر في الأردن، والتي تعتبر جميعها جزءاً لا يتجزأ من خطة عمل المدينة الخضراء GCAP.

ولتعزيز تحوّل عمّان نحو الاستدامة، طوّرت أمانة عمّان الكبرى وضعت خطة عمل المدينة الخضراء لعمّان، بدعم من البنك الأوروبي للإنشاء والتعمير EBRD، وفريق من المستشارين المتخصصين الفنيين في البنك الأوروبي للإنشاء والتعمير (شركة ايكوم والمستقبل) لتحديد وترتيب الأولويات واقتراح حلول لمواجهة هذه التحديات البيئية الأكثر إلحاحاً في عمّان.

خطة عمل المدينة الخضراء في عمّان

وضعت أمانة عمّان الكبرى خطة عمل المدينة الخضراء لمدينة عمّان، بمساهمة من وطبقاً لتوجيهات وإرشادات هيئتين من الهيئات الحكوميّة: اللجنة الفنية واللجنة التوجيهيّة. تأسست اللجنة الفنيّة بقرار من أمين عمّان. تضم هذه اللجنة (23) ممثلاً من القطاعات ذات الصلة التي يغطيها إطار عمل المدن الخضراء الذي وضعه البنك الأوروبي للإنشاء والتعمير، مثل رؤساء/نواب الوحدات الهيكلية ذات الصلة في أمانة عمّان الكبرى، وقد قدمت هذه المجموعة المشورة الفنية والتوصيات حول تحديات وفرص الاستدامة في عمّان. تم تشكيل اللجنة التوجيهية لتوفير المشورة والرقابة والإشراف للحصول على موافقة أمانة عمّان الكبرى على خطة عمل المدن الخضراء. تتألف اللجنة التوجيهية من كبار المسؤولين في أمانة عمّان الكبرى والذين يتمتعون بسلطة اتخاذ القرارات (مثل أمين عمّان وممثلي مجلس مدينة أمانة عمّان الكبرى) ورؤساء/نواب (إداما ومياها والجمعية العلمية الملكية).

تتبع عملية المدن الخضراء منهجية مستخدمة من قبل جميع المدن بموجب برنامج المدينة الخضراء التابع للبنك الأوروبي لإعادة الإعمار والتنمية لتطوير وتنفيذ "خطة عمل المدينة الخضراء".

كانت المرحلة الأولى تتمثل في وضع خط الأساس للمدينة الخضراء (ديسمبر 2018 - مايو 2019)، والتي حددت الظروف الأساسية في عمّان التي تؤثر على الأداء البيئي للمدينة، والتي تشمل:

- الإطار السياسي للأطر التشريعية والتنظيمية فوق الوطنية والوطنية والإقليمية والأمانة التي تحكم الإدارة البيئيّة، من أجل تقييم اختصاص أمانة عمّان الكبرى وأصحاب المصلحة الآخرين لمواجهة التحديات البيئية. كما تتضمن أيضاً مراجعة البرامج والمشاريع القائمة التي تركز على بيئة عمّان.
- تجميع بيانات المؤشرات البيئية باستخدام إطار "الاستجابة - الحالة - الضغط" (PSR) المكون من (70) مؤشراً أساسياً و (114) مؤشراً اختياريّاً. يوفر إطار "الاستجابة - الحالة - الضغط" نهجاً منظماً لجمع بيانات الاتجاهات حول الحالة البيئية (أي الدولة،

مثل جودة الهواء) والقطاعات (النقل، الصناعة ... الخ) ودوافع التغيير التي تؤثر على البيئة (أي الضغوط مثل الازدحام الحضري أو الاستجابات مثل مشاريع تحسين البيئة).

- التقييم الفني للبيانات البيئية لتحديد خط الأساس البيئي للمدينة، من خلال تحليل إطار "الاستجابة - الحالة - الضغط" لفهم القضايا البيئية وأسبابها الجذرية. وخلص التقييم الفني إلى مجموعة من التحديات التي تواجه المدينة، وسياق الاعتماد المتبادل الذي تنشأ فيه.

وانطلاقاً من خط الأساس للمدينة الخضراء وخلال مرحلة وضع خطة عمل المدينة الخضراء، طُوِّرت أمانة عمّان الكبرى ووضعت مجموعة من الإجراءات وخطة عمل المدينة الخضراء في المرحل التالية، والتي امتدت من شهر يونيو 2019 وحتى شهر يوليو 2020. قامت اللجنة الفنية في أمانة عمّان الكبرى والتي تم تشكيلها لدعم خطة عمل المدينة الخضراء، بالإضافة إلى دعم أصحاب المصلحة الرئيسيين بتحديد ومنح الأولوية للتحديات البيئية التي يتم تحديدها في التقييم الفني خلال ورشة عمل، تحديد أولويات التحديات الأساسية مع التركيز على مجموعة من التحديات البيئية ذات الأولوية PEC التي ترد في الجدول المذكور أدناه. تضع التحديات البيئية ذات الأولوية في الاعتبار القضايا الأكثر إلحاحاً، والتي تركز عليها خطة عمل المدينة الخضراء. وتم تحديد التحديات البيئية ذات الأولوية للمساعدة على تركيز خطة عمل المدينة الخضراء على القضية الأكثر إلحاحاً ومعالجة مسارات العمل الخاصة بها. يستجيب كل إجراء في خطة عمل المدينة الخضراء إلى تحدّي أو أكثر من التحديات البيئية ذات الأولوية المشار إليها حسب التسمية المحددة لها (أي - التحدي البيئة ذو الأولوية رقم 1-PEC).

القطاع	تحديات الضغط ** ملخص مؤشرات الأولوية	والتحديات البيئية ذات الأولوية
جودة الهواء	<p>Lu1 تضارب أولويات استخدام الأراضي والضغوط (الزحف العمراني).</p> <p>Tr1 نقص البنية التحتية للنقل العام.</p> <p>Tr2 البنية التحتية الرديئة للمشاة.</p> <p>Tr3 الانبعاثات من المركبات التي تعمل بالبترول والديزل.</p> <p>Es1 سيطرة الوقود الأحفوري على إمدادات الطاقة.</p> <p>Es2 أداء الطاقة والمياه في المباني.</p>	<p>إدارة تلوث الهواء المرتبط بالوقود</p> <p>PEC1 الأحفوري من خلال إدارة أفضل للنقل الحضري وأنظمة الطاقة</p>
دورة المياه ** النظر في كل دورات المياه (الأحوال والضغوط)	<p>Wc1 التغيير الهيدرولوجي بسبب تغير المناخ.</p> <p>Wc2 تغطية شبكات الصرف الصحي.</p> <p>Wc3 خسائر المياه غير المدرة للدخل.</p> <p>Wc4 انتشار التلوث الحضري.</p>	<p>الانتقال نحو إدارة أكثر استدامة</p> <p>PEC2 لدورات المياه للحد من الآثار المترتبة على ندرة المياه</p>
إدارة المخلفات الصلبة	<p>Sw1 ممارسات التخلص من النفايات الصلبة.</p> <p>Sw2 زيادة توليد المخلفات الصلبة.</p> <p>In1 التخلص من المخلفات الصناعية الصلبة.</p>	<p>تحسين جودة البيئة المتعلقة</p> <p>PEC3 بالنفايات (مثل التربة والمياه وتأثيرات التنوع البيولوجي) عن</p>

طريق تقليل توليد النفايات وتحسين ممارسات إدارة الموارد		
توفير بنية تحتية خضراء عالية الجودة التي يمكن الوصول إليها والمتنوعة من الناحية البيولوجية PEC4	Lu1 تضارب أولويات استخدام الأراضي والضغط.	التنوع الحيوي
	Lu2 التصحُّر.	المساحات الخضراء
	Wc1 التغيرات الهيدرولوجية بسبب تغير المناخ .	
إدارة المخاطر المتزايدة للزوائد الحضرية السريعة PEC5	Lu1 تضارب أولويات استخدام الأراضي والضغط.	التكيف مع المناخ ومخاطر الكوارث
	Lu2 التصحُّر.	
	Wc1 التغيرات الهيدرولوجية بسبب تغير المناخ .	
إدارة مخاطر الجفاف والإنهاك الشديد PEC6		

بالإضافة إلى ذلك، ومن خلال ورشة عمل تحديد أولويات التحديات، يتم وضع الركائز الأساسية من الرؤى الحالية لمدينة عمّان، والمنصوص عليها في الخطط أو الاستراتيجيات القائمة في إطار عمل يضمن تلبية الإجراءات الخاصة بالتحديات البيئية ذات الأولوية، بما يتماشى مع أهداف عمّان واسعة النطاق. ومن بين هذه الإجراءات:

- تحقيق النمو الأخضر .
 - أن تكون الإجراءات منظمة.
 - حماية تراثها.
 - أن تكون جذابة .
 - تعزيز ثقافة المشاركة والشمولية .
 - أن تكون مفعمة بالحيوية لكنها آمنة وودودة.
- وبالمثل، فقد حددت الجهات المعنية الأهداف الاستراتيجية متوسطة الأجل لتحقيق موضوعات الرؤية هذه، وأن تكون بمثابة دليل لتطوير العمل في المرحلة التالية.

الأهداف الاستراتيجية (SO)	الضغوط ذات الصلة والتحديات البيئية ذات الأولوية
SO1	زيادة إمدادات الطاقة المتجددة بنسبة (25%) بحلول عام 2035 لتحسين تنوع الطاقة والاستقلال والمرونة.
SO2	خفض معدلات الطلب على الطاقة بنسبة (15%) بحلول عام 2030 من خلال تحسين كفاءة الطاقة في المباني والأنظمة الكهربائية.
SO3	زيادة الحصة النموذجية للنقل العام بنسبة (30%) بحلول عام 2030 من خلال إضفاء الطابع المؤسسي على النقل العام وتطبيعه.
SO4	وضع استراتيجية للمجال العام تدعم تنقل المشاة.
SO5	دمج الأنظمة الذكية في تخطيط النقل.
SO6	تحسين إدارة الموارد من خلال زيادة كفاءة أنظمة إدارة النفايات الصلبة.
SO7	دمج المبادئ الدورية في إدارة النفايات.
SO8	تخفيض كمية النفايات المرسلة إلى مقالب النفايات بنسبة (12%) بحلول عام 2030.
SO9	تحديث البنية التحتية لإدارة النفايات.
SO10	تخفيض مخاطر الفيضانات في المناطق الحرجة بنسبة (50%) بحلول عام 2030.
SO11	تخفيض الفاقد في المياه بنسبة (70%) بحلول عام 2040.
SO12	تحسين الوصول إلى شبكات المياه والصرف الصحي بنسبة (100%) من شبكات عمّان بحلول عام 2040.
SO13	تحسين كفاءة استخدام المياه في المباني بنسبة (25%) بحلول عام 2030.
SO14	زيادة كمية وجودة المساحات الخضراء في عمّان.
SO15	تطوير خطة استخدام الأراضي الحديثة لضمان التنمية العادلة في جميع أنحاء عمّان.
SO16	تحسين البيئة الحضرية م.
SO17	إضفاء الطابع المؤسسي على المرونة المناخية في جميع جوانب عمليات وسياسات الأمانة.
SO18	تخفيف أو الحفاظ على تأثير الجزر الحرارية الحضرية وانبعاثات الكربون في عمّان من خلال البنية التحتية للزراعة والخضراء.
SO19	تحسين الوعي العام بتغير المناخ.

بعد ذلك قام فريق من المتخصصين الفنيين بصياغة أكثر من (200) إجراء يمكن لأمانة عمّان الكبرى تنفيذها، لتناول التحديات البيئية ذات الأولوية.

- قامت اللجنة الفنية والجهات المعنية بعمل قائمة مختصرة لهذه الإجراءات خلال ورشة عمل تحديد الأولويات، بإجراءات خطة عمل المدينة الخضراء والتي تم اعتمادها فيما بعد من جانب اللجنة التوجيهية.

- كما قام فريق من المتخصصين الفنيين بوضع هذه الإجراءات وتحديد فوائدها وخطوات تنفيذها، من أجل إجراء جولة نهائية من المشاورات مع اللجنة التوجيهية وأمين عمّان، مما يؤدي إلى وضع القائمة النهائية للإجراءات المدرجة في خطة عمل المدينة الخضراء.
- ستعمل أمانة عمّان الكبرى على تفعيل خطة عمل المدينة الخضراء خلال مرحلة التنفيذ (التي من المتوقع أن تبدأ في الفترة من شهر أغسطس 2020 وحتى شهر أغسطس 2021، والتي ستستمر بعد ذلك لمدة خمس سنوات). يتطلب النجاح في هذه المرحلة التزام كل صاحب إجراء عمل، وكذلك التزام رؤساء البلديات بما في ذلك تخصيص الموارد المالية والبشرية اللازمة. تعتبر عمّان من المدن الفعالة بشكل كبير في مجموعة من القطاعات (مثل إدارة دورة المياه) وبالتالي تعتبر بعض الإجراءات المؤثقة في هذه الخطة قيد التنفيذ على قدم وساق.

المرحلة الأخيرة في عملية المدن الخضراء هي مرحلة إعداد تقارير عن المدينة الخضراء (التي من المتوقع أن تبدأ في الفترة من شهر أغسطس 2021 وحتى شهر أكتوبر 2021، والتي ستستمر بعد ذلك لفترات زمنية منتظمة خلال فترة التنفيذ). يتم دعم خطة عمل المدينة الخضراء من خلال خطة التقييم والرصد المفصلة، والتي توثق الأنشطة التي سيتم القيام بها لتتبع عملية تنفيذ خطة عمل المدينة الخضراء، وكذلك الآثار المترتبة على هذه الإجراءات على حالة البيئة في عمّان.

تنص هذه الوثيقة متطلبات إعداد التقارير الدورية، وإجراءات المتابعة التي سيتم اتخاذها للاستجابة لنتائج عمليات المراقبة والتقييم (على سبيل المثال، تعديل الإجراءات التي ثبت أنها أقل فعالية من المتوقع).

يُلخص الفصل النهائي من خطة عمل المدينة الخضراء الحالية الأدوار والمسؤوليات التي تم وضعها وتحديداتها لتنفيذ خطة عمل المدينة الخضراء، وتتبع التقدم الذي تم إحرازه في تنفيذها (التسليم والتأثير). تتضمن هذه المهام الرئيسية منسق المدينة الخضراء، ومجلس تنسيق خطة عمل المدينة الخضراء، وأبطال المدينة الخضراء التي تم الموافقة عليها من جانب اللجنة التوجيهية في شهر يوليو 2020. سوف تحدد هذه الأدوار المسألة عن التقدم الذي تم إحرازه في تنفيذ خطة عمل المدينة الخضراء، خلال الفترات الزمنية المحددة في هذه الوثيقة. تم وضع عملية شفافة لرصد وتقييم وتقديم التقارير التي تتعلق بتنفيذ خطة عمل المدينة الخضراء، مدعومة بآيتين من الأدوات التي تستخدم برنامج إكسل، وتتمثل أهداف هذا النهج في:

- تتبع التقدم الذي تم إحرازه في إجراءات خطة عمل المدينة الخضراء من خلال خطة متابعة ورصد التقدم الذي تم إحرازه.
- تحديد إذا ما كان كل إجراء تم تنفيذه قد حقق النتائج المرجوة والآثار المنشودة، وربطه مرة أخرى بمؤشرات الحالة والضغط من خلال خطة متابعة ورصد التأثير؛
- تسهيل التعرف على الإجراءات الفعّالة والإجراءات غير المثمرة، من حيث الإجراءات وهيكل الإدارة والتسليم المطبقة في أمانة عمّان الكبرى؛
- تحديد التعديلات التي يجب القيام بها خلال تنفيذ خطة عمل المدينة الخضراء لزيادة إمكانات التأثير الإيجابي.

يمكن أن تكون نتائج مراقبة خطة عمل المدينة الخضراء مكملّة لأجندات التخطيط والأنشطة الأخرى في أمانة عمّان الكبرى. وبالتالي سوف يهدف منسق المدينة الخضراء إلى مواءمة عملية الرصد والتقييم مع العمليات الأخرى في المدينة. إن مواءمة عملية رصد ومراقبة خطة عمل المدينة الخضراء مع الأنشطة المقررة الأخرى في أمانة عمّان الكبرى، سيساعد على تبسيط عمليات جمع البيانات مع مبادرات مشاركة أصحاب المصلحة، مما يؤدي إلى تقليل الازدواجية وتحسين الكفاءة.

كانت مدخلات أصحاب المصلحة والجهات المعنية سمة أساسية في كل مرحلة من مراحل خطة عمل المدينة الخضراء، وذلك لضمان أن الإجراءات النهائية تخدم بشكل أفضل احتياجات سكان عمّان والتنوع. ومنذ بداية المشروع في شهر ديسمبر 2018 وحتى وضع خطة عمل المدينة الخضراء النهائية في شهر أغسطس 2020، شارك أصحاب المصلحة والجهات المعنية بعدة طرق في فترات متنوعة. بالإضافة إلى ذلك وضعت أمانة عمّان الكبرى خطة المشاركة العامة والأنشطة التجريبية بالاشتراك مع البنك الأوروبي لإعادة الإعمار والتنمية، ومنظمة

قادة الغد LoT، وهي منظمة مجتمع مدني محلية يترأسها الشباب، وشركة إيكوم لتعزيز خطة عمل المدينة الخضراء وإنشاء إطار معياري مشاركة الجمهور في البرامج المستقبلية في عمان.

الإجراءات الخاصة بعمّان الخضراء

تقترح شركة خطة المدينة الخضراء في عمان 41 استثمار قصير الأجل (5 سنوات) و (22) إجراء تمكيني طويل الأجل (اعتبارًا من عام 2025 أو ما بعده) والتي تندرج تحت المجالات المواضيعية التالية:

- أنظمة الطاقة والمباني الفعالة والمرنة؛
- أنظمة التنقل التي يمكن الوصول إليها بسهولة والمتنوعة وذات انبعاثات الكربون المنخفضة؛
- ؛
- نظم إدارة النفايات ذات الكفاءة في استخدام الموارد والشاملة؛
- الإدارة المتكاملة لموارد المياه؛
- التخطيط الشامل والفعال لاستخدام الأراضي؛
- ممارسات التكيف مع المناخ المستجيبة والمستقبلية؛

لمحة عامة – تكلفة الإجراءات

العدد الإجمالي للإجراءات قصيرة المدى: (36)

التكلفة الإجمالية المقدرة: د.أ. 225,318,637 – د.أ. 175,895,118 (175,895,118) د.أ. 1

التكاليف الرأسمالية	
عدد الإجراءات (21)	التكلفة المقدرة كحد أدنى (173,204,313) د.أ.
	الحد الأقصى للتكلفة المقدرة (221,863,523) د.أ.
التكاليف التشغيلية	
عدد الإجراءات (3)	التكلفة المقدرة كحد أدنى (140,871) د.أ.
	الحد الأقصى للتكلفة المقدرة (192,859) د.أ.
تكاليف التصميم/ التطوير	

تمت عملية تحويل العملة باستخدام عن طريق (1.19258/1) د.أ./ يورو xe.com at 27/10/2020¹

عدد الإجراءات (10)

التكلفة المقدرة كحد أدنى (2,549,934) د.أ.

الحد الأقصى للتكلفة المقدرة (3,262,255) د.أ.



ملحوظة: لم يتم التأكد على تكاليف الإجراءات رقم (EB4.1, EB4.2) والإجراء (EB6) ولم يتم تضمينها في التقديرات المذكورة أعلاه

الإجراءات ذات الأولوية

إن تقديم مجموعة مناسبة من إجراءات خطة عمل المدينة الخضراء أمر بالغ الأهمية لتعزيز التنمية المستدامة في عمّان. ولأغراض التنفيذ الاستراتيجية لإجراءات خطة عمل المدينة الخضراء، فقد حددت أمانة عمّان الكبرى ثماني إجراءات ذات أولوية:

- EB2: دمج نظم الليد في إنارة شوارع الأمانة.
- T1: توسيع شبكة الحافلات المتكاملة وأسطول النقل منخفض الانبعاثات.
- SW2: تحسين محطة الشعائر لنقل النفايات.
- SW4: إنشاء أجزاء إضافية لمكببات المخلفات.
- W1: تطوير عمليات نقل المياه و/أو تخزين المياه لتقليل مخاطر الفيضانات.
- W2: إيقاف تشغيل محطة عين الغزال وتحديثها.
- W3: تطوير مرفق الغباوي للصرف الصحي.
- LU1: الاستثمار في التوسع في المساحات الخضراء.
- CA1: تطوير وإنشاء بنية تحتية لمواقف السيارات الخضراء و/أو المظلة.

نظم الطاقة والمباني الفعالة والمرنة

تعتبر نظم الطاقة والمباني هي المكون الرئيسي للاستدامة. عندما تعتمد نظم الطاقة على احتراق الوقود الأحفوري فتعتبر غير قادرة على الصمود أمام النقص في إمدادات الوقود الأحفوري، ويساهم الاحتراق في تغيير المناخ وسوء جودة الهواء. قام الأردن باتخاذ خطوات مختلفة تهدف لاستخدام الطاقة المتجددة وبالتالي العمل على تخفيف انبعاثات غاز الكربون الكثيف من خلال مساهمته على المستوى الوطني بموجب نص اتفاقية باريس ومن خلال السياسات التي تعزز استهلاك الطاقة المتجددة التي تضم الطاقة الشمسية.. تعمل أمانة عمّان الكبرى أيضًا على تعزيز مرونة وكفاءة نظم الطاقة والمباني على حد سواء.

سوف تقوم خطة عمل المدينة الخضراء على الأعمال الحالية، وسوف تساهم في إطار نظم الطاقة والمباني الفعالة والمرنة وإنشاء مخزون منها في عمّان. فيما يلي تفاصيل الأهداف الاستراتيجية والإجراءات الداعمة ذات الصلة بهذا المجال:

الأهداف الاستراتيجية (SO)	الضغوط ذات الصلة والتحديات البيئية ذات الأولوية
SO1	زيادة إمدادات الطاقة المتجددة بنسبة (25%) بحلول عام 2035 لتحسين تنوع الطاقة والاستقلال والمرونة.
	PEC1, Es1

PEC1, Es2	خفض معدلات الطلب على الطاقة بنسبة (15%) بحلول عام 2030 من خلال تحسين كفاءة الطاقة في المباني والأنظمة الكهربائية.	SO2
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التحديات	الإجراءات طويلة الأجل	التحديات	إجراءات التمكين	التحديات البيئة ذات الصلة والضغط الرئيسية	إجراءات الاستثمار
البيئة ذات الصلة والضغط الرئيسية		البيئة ذات الصلة والضغط الرئيسية			
نظم الطاقة المباني					
Es1 PEC6	إنشاء حملات توعية حول دعم الألواح الشمسية الوطنية	Es1 PEC2 Es2 PEC6	زيادة التوعية بتصميم المباني الخضراء	Es1 PEC1	الاستثمار في مشاريع الطاقة الشمسية واسعة الشبكات
Es1 PEC1	تركيب وحدات الطاقة الشمسية أعلى المنازل في المباني ومواقف السيارات والتعريشات المملوكة لأمانة عمّان الكبرى	Es1 PEC1 Es2		Es1 PEC1 Es2	دمج نظم الليد التي تعمل بالطاقة الكهربائية لإنارة شوارع الأمانة
Es1 PEC1 Es2	تركيب نظم التدفئة البديلة في مباني الأمانة	Es1 PEC1 Es2		Es1 PEC1 Es2	تمويل العدادات الذكية والبطاريات لتعزيز استقرار الشبكة
		Es1 PEC2 Es2 PEC6		Es1 PEC2 Es2 PEC6	تحديث تجريبي لمباني الأمانة الخضراء
		Es1 PEC2 Es2 PEC6		Es1 PEC2 Es2 PEC6	إنشاء مباني مدارس خضراء
		Es1 PEC1 Es2		Es1 PEC1 Es2	تطوير محطات الحافلات التي تعمل بالطاقة الشمسية
		Es1		Es1	توسعة نظام استرداد غاز مكب النفايات (LFG)

نظم التنقل التي يمكن الوصول إليها بسهولة والمتنوعة وذات انبعاثات الكربون المنخفضة :

يعتبر التنقل هو مفتاح المساحات الحضرية الصحية والحيوية والشاملة، مما يوفر سهولة الوصول إلى الوظائف والخدمات والترفيه وكذلك العائلات والأصدقاء. ومع ذلك تعتبر نظم التنقل الحالية هي أحد العوامل الرئيسية المساهمة في التحديات البيئية التي تواجهها عمّان فيما يتعلق بجودة الهواء وانبعاثات غاز الاحتباس الحراري. تعتبر السيارات الخاصة وسيلة التنقل الرئيسية في المدينة والإزدحام شائع للغاية في

المدينة. وقد أدى ذلك إلى سوء نوعية الهواء وما يتعلق به من أمراض الجهاز التنفسي والتي يعاني منها سكان عمّان. وقد بدأت المدينة بالفعل في معالجة هذه الأمور من خلال تطوير نظام النقل السريع بالحافلات، وسوف تسعى جاهدة إلى تحقيق الأهداف الاستراتيجية التالية التي تتعلق بنظم النقل المتنوعة، والتي يسهل الوصول إليها وذات انبعاثات الكربون المنخفضة.

تسعى الأهداف الاستراتيجية والإجراءات الداعمة ذات الصلة بها في هذا المجال الموضوعي والواردة بالتفصيل أدناه إلى البناء على هذا العمل، من خلال دمج العديد من خيارات النقل العامة وغير الآلية في شبكة عمّان مع تعزيز البنية التحتية للمشاة، بالإضافة إلى المساحات الخضراء والمساحات العامة المفتوحة.

الأهداف الاستراتيجية (SO)		الضغوط ذات الصلة والتحديات البيئية ذات الأولوية
SO3	زيادة الحصة النموذجية للنقل العام بنسبة (30%) بحلول عام 2030 من خلال إضفاء الطابع المؤسسي على النقل العام وتطبيقه.	Pc1, Pc4, Pc5
SO4	وضع استراتيجية للمجال العام تدعم تنقل المشاة.	
SO5	دمج الأنظمة الذكية في تخطيط النقل.	

إجراءات الاستثمار			التحديات		إجراءات التمكين		التحديات		الإجراءات طويلة الأجل		التحديات	
البيئة ذات الصلة والضغوط الرئيسية			البيئة ذات الصلة والضغوط الرئيسية		البيئة ذات الصلة والضغوط الرئيسية		البيئة ذات الصلة والضغوط الرئيسية		البيئة ذات الصلة والضغوط الرئيسية		البيئة ذات الصلة والضغوط الرئيسية	
نظم التنقل التي يمكن الوصول إليها بسهولة والمتنوعة وذات انبعاثات الكربون المنخفضة												
T1	التوسع في شبكة الحافلات المتكاملة وأسطول الحافلات منخفضة الانبعاثات		PEC1	Tr1	T4	تحديد أيام خالية من تواجد السيارات في مركز المدينة لتعزيز الفعاليات في وسط المدينة وأنشطة التنقل		PEC1	Tr2	T6	تحسين سلامة المشاة	
				Tr3								
T2	تنفيذ مشاريع تجريبية لتعزيز أنشطة النقل		PEC1	Lu1	T5	وضع خطة النقل الحضرية المستدامة والمتكاملة		PEC1	Tr2	T7	الاستثمار في إنشاء السكك الحديدية الخفيفة أو شبكة الترام	
				Tr2					Tr3			
T3	تركيب نظم النقل الذكية		PEC1	Tr2						T8	تنفيذ نظم الدراجات المشتركة	
				Tr3								

Tr1	PEC1	إنشاء ممرات الحافلات ذات الأولوية على الطرف الرئيسية	T9
Tr1	PEC1	دمج محور التنقل في	T10
Tr2		تقاطعات BRT الهامة	
Lu1	PEC1	تعديل إرشادات تصميم	T11
Tr2	PEC4	الشوارع لتقديم استراتيجية عامة أكثر تناسقاً	

Tr2	PEC1	توفير خدمات	T4.1
Tr3	PEC4	الحافلات المجانية من وإلى منطقة المشاة التجريبية في الأيام المحددة	

نظم إدارة النفايات الشاملة ذات الكفاءة في استخدام الموارد

تعتبر نظم إدارة النفايات الحضرية خدمة أساسية تساهم في صحة الإنسان وصحة البيئة. بالإضافة إلى ذلك، تعتبر الإدارة الفعالة للنفايات ضرورية لدعم كفاءة الموارد من خلال استراتيجيات الحد من المخلفات وإعادة التدوير وتيارات النفايات العضوية. ازداد توليد النفايات والمخلفات في عمّان بما يتوافق مع النمو السكاني للمدينة، مما أدى إلى الضغط على البنية التحتية الحالية للنفايات في المدينة. اتخذت المدينة خطوات للتخفيف من هذا الضغط بما في ذلك توسيع مكب الغباوي للنفايات. سوف تساهم الإجراءات المحددة في وصول أمانة عمّان الكبرى وتحقيق أهدافها الاستراتيجية المقترحة لإدارة وتقليل نفاياتها ومخلفاتها بكفاءة أكبر. علاوة على ذلك تدعم الإجراءات المقترحة أيضاً تحقيق أهداف الطاقة في أمانة عمّان من خلال تسخير الطاقة المستمدة من المواد العضوية وغير العضوية.

الأهداف الاستراتيجية (SO)		الضغوط ذات الصلة والتحديات البيئية ذات الأولوية
SO6	تحسين إدارة الموارد من خلال زيادة كفاءة أنظمة إدارة النفايات الصلبة.	Sw1, Es1
SO7	دمج المبادئ الدورية في إدارة النفايات.	
SO8	تخفيض كمية النفايات المرسلة إلى مقالب النفايات بنسبة (12%) بحلول عام 2030.	
SO9	تحديث البنية التحتية لإدارة النفايات.	

إجراءات الاستثمار	التحديات	إجراءات التمكين	التحديات	الإجراءات طويلة الأجل	التحديات
البيئة ذات الصلة والضغوط الرئيسية	البيئة ذات الصلة والضغوط الرئيسية	البيئة ذات الصلة والضغوط الرئيسية	البيئة ذات الصلة والضغوط الرئيسية	البيئة ذات الصلة والضغوط الرئيسية	البيئة ذات الصلة والضغوط الرئيسية
إدارة النفايات الصلبة					

Sw1	PEC3	تنفيذ مجموعة منفصلة إلزامية للمواد الجافة الرئيسية القابلة لإعادة التدوير	SW8	Sw1 In1	PEC3	استراتيجية منع النفايات وإعادة التدوير	SW1	Sw1 In1	PEC3	تحسين محطة الشعائر لنقل النفايات	SW2
Sw1	PEC3	وضع أهداف قانونية لإعادة التدوير	SW9					Sw1 In1	PEC3	شراء سيارات كنس الشوارع لتحسين المجال العام	SW3
Sw1	PEC3	فرض ضريبة التخلص من النفايات لزيادة عمليات إعادة التدوير واستعادتها وإنشاء وظائف جديدة	SW10					Sw1 In1 Es1	PEC3	إنشاء مكبات النفايات الإضافية	SW4
								Sw1 In1 Es1	PEC3	عمل شراكة مع القطاعات التجارية واسعة النطاق لجمع المخلفات العضوية	SW5
								Sw1 In1	PEC3	1.1 إنشاء منشأة لنقل النفايات من خلال توجيه النفايات الكهربائية والأجهزة الإلكترونية	SW6
								Sw1 In1	PEC3	1.2 إنشاء مرفق لاستعادة المواد النظيفة وإنشاء برنامج إعادة التدوير	SW7

الإدارة المتكاملة لموارد المياه

تعتبر جودة المياه وتوافرها أمراً في غاية الأهمية للحياة. وباعتبار عمّان من المدن التي تقع في المناطق التي تعاني من ندرة المياه، اتخذت عمّان بالفعل إجراءات، بالتعاون مع الحكومة الوطنية، لمتابعة الإمدادات الكافية والفعالة وإعادة استخدام المياه، على الرغم من أنه لا تزال هناك فرصة لتوسيع نطاق الجهود المبذولة. ومع ذلك فإن إدارة موارد المياه تتجاوز عمليات توفير المياه ومياه الصرف الصحي للمواطنين، وترتبط ارتباطاً وثيقاً بالتنظيم البيئية واستخدام الأراضي. على سبيل المثال، تتضمن التحديات الرئيسية في عمّان مواجهة الفيضانات المفاجئة والتصحر وهما في طرقي نقيض في دورة المياه مدفوعة بشكل كبير بتضاريس عمّان. بالإضافة إلى تغيير استخدام الأراضي مع زيادة نمو حجم المدينة. تشكل هذه التحديات خطراً على صحة الإنسان ورفاهيته، وتضع عبئاً على الموارد المالية للمدينة وجميع المتضررين.

تهدف الأهداف الاستراتيجية والإجراءات المقترحة أدناه إلى إدارة مخاطر الفيضانات بشكل أفضل، مع تحسين جودة المياه وتحديث وتوسيع البنية التحتية الحيوية للمياه ودمج النظم الفعالة في بيئة البناء.

الأهداف الاستراتيجية (SO)		الضغوط ذات الصلة والتحديات البيئية ذات الأولوية
SO10	تخفيض مخاطر الفيضانات في المناطق الحرجة بنسبة (50%) بحلول عام 2030.	Pc2, Pc4, Pc6, Wc1, Wc2, Wc3, Wc4, Lu1, Lu2
SO11	تخفيض الفاقد في المياه بنسبة (70%) بحلول عام 2040.	
SO12	تحسين الوصول إلى شبكات المياه والصرف الصحي بنسبة (100%) من شبكات عمّان بحلول عام 2040.	
SO13	تحسين كفاءة استخدام المياه في المباني بنسبة (25%) بحلول عام 2030.	

إجراءات الاستثمار		التحديات	إجراءات التمكين		التحديات	الإجراءات طويلة الأجل		التحديات
البيئة ذات الصلة والضغوط الرئيسية		البيئة ذات الصلة والضغوط الرئيسية			البيئة ذات الصلة والضغوط الرئيسية			البيئة ذات الصلة والضغوط الرئيسية
إدارة دورة المياه								
W1	تطوير عمليات نقل المياه و/أو تخزين المياه لتقليل مخاطر الفيضانات	PEC2 PEC5 PEC6	Wc1 Wc4	W4	دمج التصميم الحضري الدقيق للمياه ونظام الصرف المستدام	PEC2 PEC4 PEC5 PEC6	W7	تركيب تجهيزات موفرة للمياه في مباني الأمانة العامة
W2	وقف محطة عين غزال لمعالجة المياه وتحديثها	PEC2 PEC5 PEC6	Wc2 Wc4	W6	تطوير وتوسيع نطاق الوصول إلى شبكات المياه والصرف الصحي	PEC2 PEC5 PEC^	W8	تنفيذ عمليات إعادة تدوير المياه وتجميع مياه الأمطار
W3	تطوير مرافق الغباوي للصرف الصحي	PEC2 PEC6	Wc2		إقامة شراكات مع المنظمات غير الحكومية لدعم المجتمعات منخفضة الدخل لتجميع مياه الأمطار		W9	
W4.1	تنفيذ تجريبي لنظام الصرف المستدام على ممتلكات الأمانة	PEC2 PEC4 PEC5 PEC6	Wc1 Wc4 Lu1 Lu2					

Wc1	PEC4	تنفيذ الحلول القائمة	W5
Wc4	PEC5	على الطبيعة لبحيرة	
Lu1	PEC6	الرصيفة الطبيعية.	
Lu2			

التخطيط الشامل والفعال لاستخدام الأراضي

يوفر تخطيط استخدام الأراضي الأساس الذي تقوم عليه أنماط الحياة الحضرية. وتوفر سبل الوصول إلى الفرص والخدمات ومدى سهولة انتقال الناس من مكان لآخر، وتساهم في صحة أو تدهور خدمات النظام الإيكولوجي، ويساهم كل ذلك في رفاهية سكان المدينة. يتضمن ذلك تحسين البنية التحتية الخضراء والتي يمكن أن تخفف من التحديات البيئية، والتي تدعم التنوع البيولوجي وتعمل على تنظيم المناخ المحلي الحضري بشكل أفضل، من خلال توفير بيئة جذابة للترفيه والاستجمام.

تهدف الأهداف الاستراتيجية والإجراءات المقترحة أدناه إلى خلق بيئة تنظيمية شاملة توفر معايير وبروتوكولات واضحة للتنمية، وتمنح الأولوية لإدراج البنية التحتية الخضراء التي تعزز المجال العام وتساعد على التخفيف من التحديات البيئية.

الضغوط ذات الصلة والتحديات البيئية ذات الأولوية	الأهداف الاستراتيجية (SO)
Pc2, Pc4, Pc6, Pc8, Tr1, Tr2, Wc1, Lu2	<p>SO14 زيادة كمية وجودة المساحات الخضراء في عمان.</p> <p>SO15 تطوير خطة استخدام الأراضي الحديثة لضمان التنمية العادلة في جميع أنحاء عمان.</p> <p>SO16 تحسين البيئة الحضرية.</p>

التحديات		الإجراءات طويلة الأجل		التحديات		إجراءات التمكين		التحديات البيئة		إجراءات الاستثمار	
البيئة ذات الصلة والضغط الرئيسية				البيئة ذات الصلة والضغط الرئيسية				ذات الصلة والضغط الرئيسية			
استخدام الأراضي											
Lu1 Lu2	PEC4 PEC5 PEC6	وضع تسلسل للمساحات المفتوحة	LU5	Lu1 Lu2 Tr2	PEC4	وضع استراتيجية البيئة التحتية الخضراء المتكاملة	LU1.1	Wc1 Lu2	PEC2 PEC4 PEC5	في الاستثمار التوسع المساحات الخضراء	LU1
Lu1	PEC4 PEC6	وضع استراتيجية التكثيف	LU6	Wc1 Lu1 Tr1 Tr2	PEC1 PEC3 PEC4 PEC5	وضع خطة الخدمة والتنفيذ لشرق عمان	LU2				
Lu1	PEC4 PEC5	تجديد الأرض المهجورة أو الشاغرة	LU7	Wc1 Wc4 Lu1 Tr1 Tr2	PEC1 PEC4 PEC5 PEC6	الانتهاء من صياغة المخطط الشمولي الاستراتيجي لعمّان 2060 وتنفيذه	LU3				
Lu1	PEC4	دمج المزيد من ملاعب الأطفال في الحدائق	LU8	Lu1 Tr1 Tr2 Wc1 Wc2 Wc3 Wc4	PEC1 PEC4 PEC5 PEC6	إنشاء قاعدة بيانات مركزية لنظام المعلومات الجغرافية	LU4				
Lu1 Lu2	PEC4 PEC5	حماية وتوسيع في المساحات الخضراء	LU9								
Lu1 Lu2	PEC4 PEC5	إنشاء مخصصات المجتمع	LU10								
Lu1 Tr1 Tr2	PEC1 PEC4 PEC6	تحسين البنية التحتية للبيئة الحضرية	LU11								
Lu1 Lu2 Tr2 Wc4	PEC4	مراقبة ورصد الاستخدامات الغير قانونية للمساحات الخضراء	LU12								

Lu1	PEC4	إنشاء صندوق	LU13
Lu2		المساحات الخضراء	
Wc4			

ممارسات التكيف مع المناخ المستجيبة والمستقبلية

يشكل المناخ تحديًا شاملاً يتم الشعور به بالفعل وسوف يستمر في التأثير على المدن. في عمّان، سيكون لتغير المناخ تأثير خاص على دورة المياه وتأثير الجزر الحرارية الحضرية. وبالتالي فمن الضروري دمج المشاريع وبروتوكولات التوعية بالمناخ في المؤسسات والنظم في عمّان. يعتبر التصرف في وقت مبكر أمرًا مهمًا بشكل خاص، حيث يوفر التطوير المستمر في عمّان فرصة لتجنب الوقوع في ممارسات عدم القدرة على التكيف.

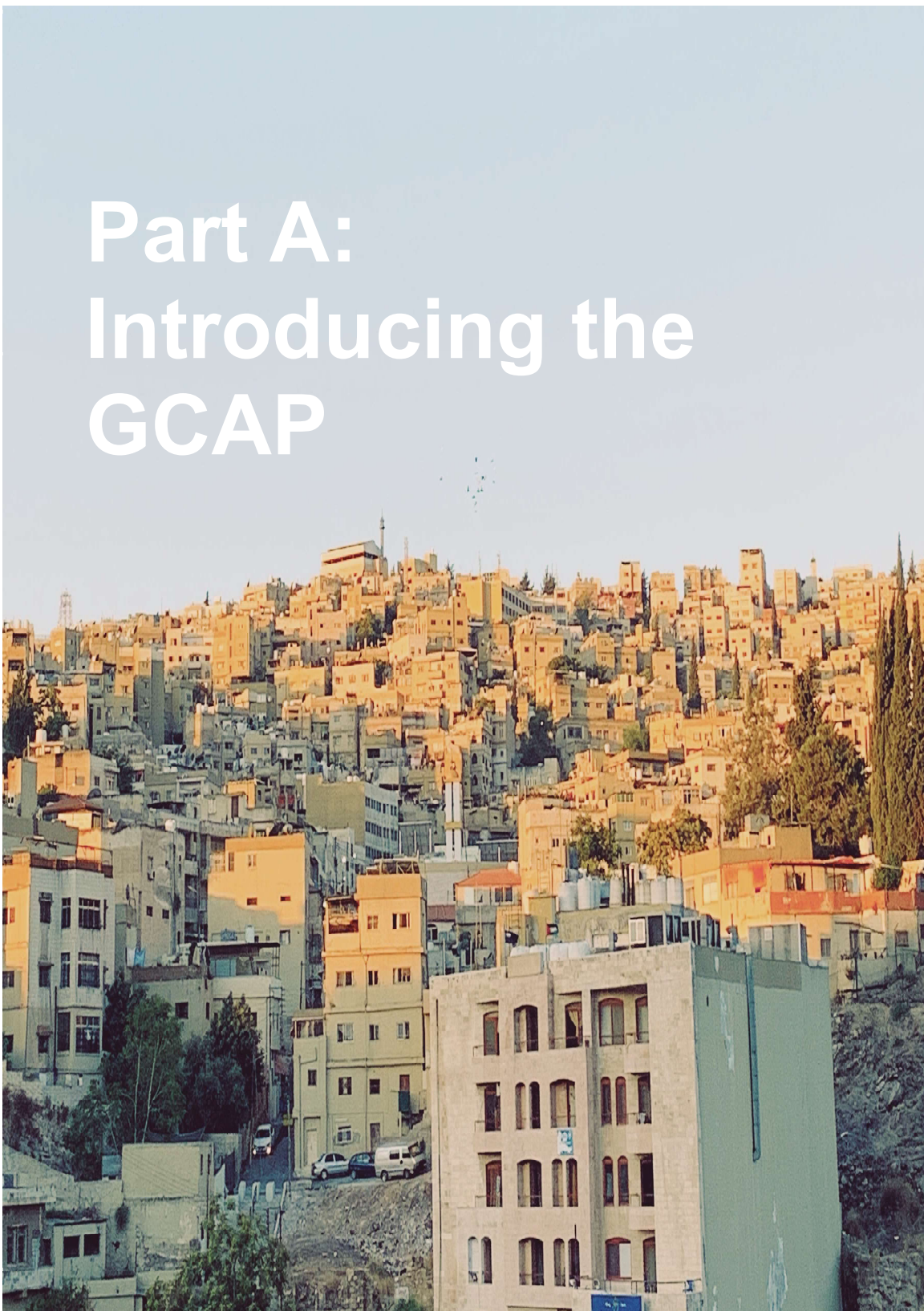
قامت الحكومة المحلية والأمانة بتنفيذ العديد من المشاريع لتناول مخاطر المناخ في عمّان. واستنادًا إلى هذه المشاريع، شددت أمانة عمّان الكبرى على الحاجة إلى إضفاء الطابع المؤسسي على ممارسات التكيف مع المناخ بسرعة الاستجابة والمستقبلية. وعلى هذا النحو، يتم اختيار الأهداف والإجراءات الاستراتيجية أدناه، لأنها تسعى إلى تطوير ووضع استراتيجيات شاملة لزيادة التوعية وتحديد تدابير التكيف الواضحة لمواجهة التحديات الرئيسية المحددة.

الأهداف الاستراتيجية (SO)		الضغوط ذات الصلة والتحديات البيئية ذات الأولوية
SO17	إضفاء الطابع المؤسسي على المرونة المناخية في جميع جوانب العمليات والسياسات الأمانة.	Pc4, Pc5, Pc7, Pc8, Lu1, Lu2, Wc1, Wc4, Es1
SO18	تخفيف أو الحفاظ على تأثير الجزر الحرارية الحضرية وانبعاثات الكربون في عمّان من خلال البنية التحتية الزرقاء والخضراء.	
SO19	تحسين الوعي العام بتغير المناخ.	

إجراءات الاستثمار			التحديات			إجراءات التمكين			التحديات			الإجراءات طويلة الأجل			التحديات البيئية ذات الصلة والضغوط الرئيسية		
البيئة ذات الصلة والضغوط الرئيسية			البيئة ذات الصلة والضغوط الرئيسية						البيئة ذات الصلة والضغوط الرئيسية								
التكيف على تغير المناخ																	
CA1	تطوير البنية التحتية لمواقف السيارات الخضراء و/أو المظللة		PEC4	Lu1	CA2	تنفيذ خطة مشاركة المجتمع في تغير المناخ		PEC5	Lu1	CA4	تطوير خدمات المناخ الخاصة بعمّان		PEC5	Lu1	PEC6	Lu2	Wc1
			PEC5	Lu2					Es1								
				Es1					Wc1								

Lu1Lu2 Es2	PEC4	تنفيذ مخططات التخلص من الكربون	CA5	Lu1 Wc1	PEC5	إعداد استراتيجية مقاومة	CA3
Lu1 Lu2 Es2	PEC4	تنفيذ تخطيط استخدام الأراضي التي تركز على المناخ	CA6			الفيضانات	
Lu1Lu2 Es2 Wc1	PEC4 PEC5 PEC6	إنشاء مركز أبحاث المرونة الحضرية	CA7				

Part A: Introducing the GCAP



1. Introduction

1.1 Overview and Purpose of GCAP

Over the last decade, the Greater Amman Municipality (GAM) has taken significant action towards improving its environmental performance. Building on existing work, GAM aims to take a more systematic approach to addressing its existing and emerging urban environmental challenges. To support this, GAM is participating in the European Bank for Reconstruction and Development's (EBRD) Green Cities programme. Launched to facilitate a better and more sustainable future for cities and their residents, the programme recognises the need for participating cities to:

- Preserve the quality of their environmental assets and use natural resources sustainably;
- Mitigate and adapt to the risks of climate change; and
- Ensure that environmental policies and developments contribute to the social and economic wellbeing of residents.²

As part of EBRD's Green Cities programme, GAM has received support to develop a Green City Action Plan (GCAP). The preparation of the GCAP provides an important opportunity for GAM and its stakeholders to:

- Establish an up-to-date evidence base for defining and prioritising the environmental challenges of Amman ('Green City Baseline');
- Identify the City's key environmental challenges and priority sectors ('Green City Challenges');
- Identify and prioritise actions that GAM can take to improve its environmental sustainability ('Green City Policy Options and Actions');
- Build local capacity to ensure successful implementation of the GCAP; and
- Monitor relevant indicators and report on progress and outcomes.

The GCAP for Amman has been developed over 18 months with input from over 70 stakeholders. It proposes 36 short-term actions and 28 long-term actions that include infrastructure investments, policy measures, capacity development, and advocacy, all of which are designed to help achieve the vision for a green Amman.

1.2 How to read this document

The rest of the GCAP is set out as follows:

Chapter 2: The GCAP Process for Amman. This section details the four steps of the GCAP methodology from establishing a baseline through to reporting.

Chapter 3: Stakeholder and Public Engagement in Amman. This section covers the range of stakeholder and public engagement activities, workshops and meetings that were conducted.

Chapter 4: Summary of City and Environmental Context. This section provides a brief overview of the city and sets out the priority environmental challenges that the GCAP seeks to address.

Chapter 5: Green City Actions for Amman. The actions are divided into the following sub-sections:

5.1: Immediate investments. Capital projects and investments to support transitions towards a green city

5.2: Enabling Actions. Policies, plan and strategies, and capacity-building programmes that will develop an enabling environment for sustainable and resilient projects.

Chapter 6: Monitoring our Progress and Impact. Describes protocols for implementation, as well as the monitoring and evaluation programme.

² EBRD, 'EBRD Green Cities.' Available at: <https://www.ebrdgreencities.com/about> [Accessed 19 June 2019].

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Appendix A: Baseline Conditions in Amman. Describes the baseline environmental conditions in Amman, including the sectors exerting pressure and the current responses to environmental challenges.

Appendix B: Co-benefits Assessment. Outlines the aggregated benefits of the GCAP actions.

Appendix C: CO₂ Calculations Assumptions. Identifies the assumptions underlying the calculations for carbon emission savings for the actions for which these were defined.

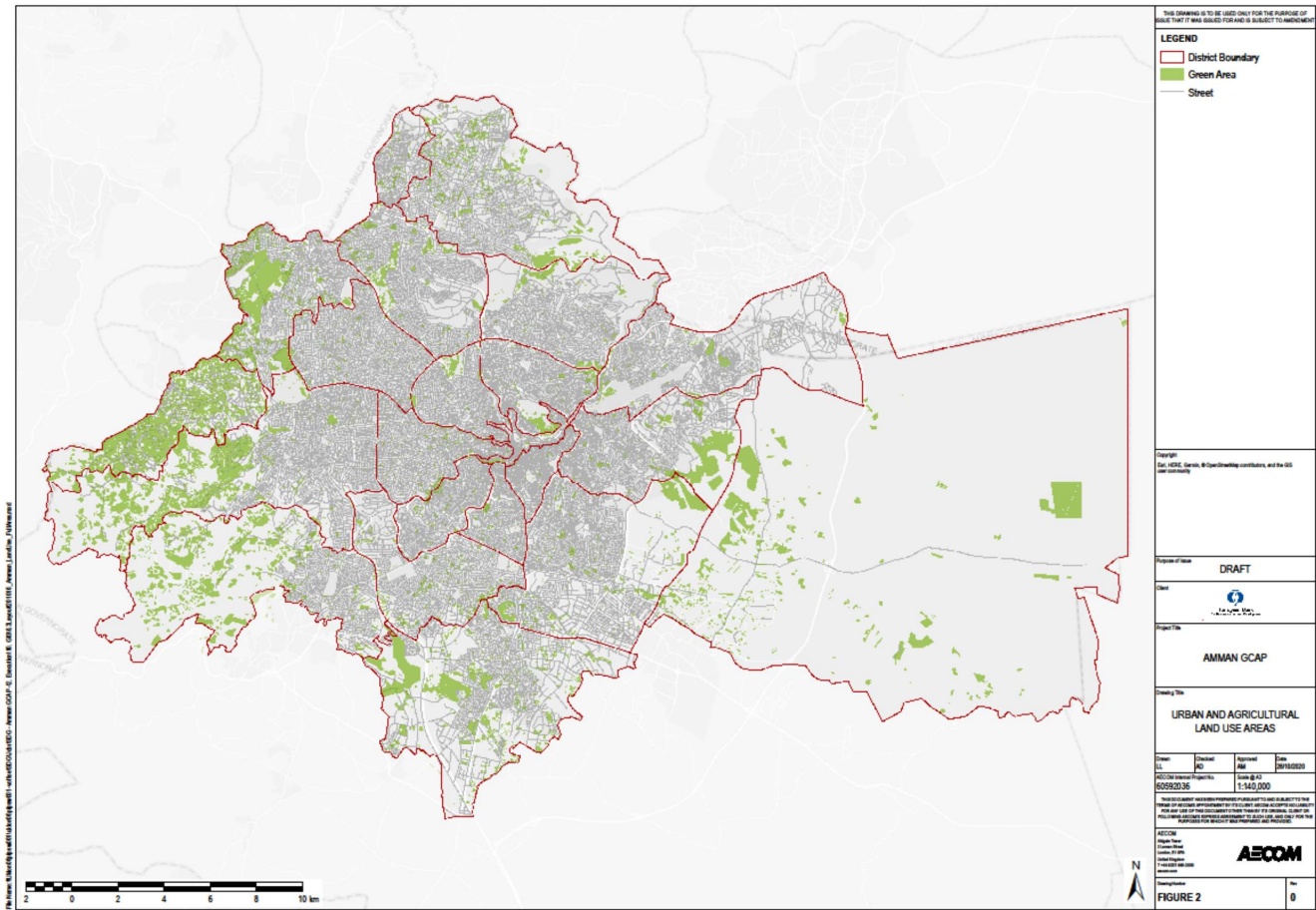
Appendix D: Environmental Indicator Data. Identifies the indicators collected through the development of the GCAP.

Appendix E: Long-term Actions. Sets out the 22 long-term actions that will be taken up after 2024.

1.3 Spatial Coverage of the GCAP

The City of Amman is divided into 22 districts covering 800 km² (Figure 1.1.). This GCAP focuses on issues and actions within the institutional mandate of GAM; however, some environmental issues extend beyond political boundaries and GAM's remit. As such, many of the proposed actions will also require the engagement of National Ministries, agencies and stakeholders.

Figure 1.1. Coverage of this GCAP



2. The GCAP Process for Amman

The EBRD in conjunction with the Organisation for Economic Cooperation and Development (OECD) and the International Council of Local Environmental Initiatives (ICLEI) has developed a consistent, but flexible, methodology for all cities in the programme to follow. The methodology follows four steps: (1) Green Cities Baseline; (2) Green City Action Plan; (3) Green City Implementation, and (4) Green City Reporting.

I. Green City Baseline

The Green City Baseline establishes the underlying conditions in Amman that influence environmental performance, covering the:

- **Political framework** of supra-national, national, regional, and municipal legislative and regulatory frameworks that govern environmental management in order to establish the remit of GAM and other stakeholders to address environmental challenges. This also includes a review of existing programme and projects focused on Amman's natural and built environment.
- Collation of environmental **indicator data** using a 'Pressure-State-Response' (PSR) framework of 70 core and 114 optional indices. The PSR provides a structured approach to collecting trend data on the environmental condition (i.e. the State such as air quality) and the sectoral (transport, industrial etc) drivers for change acting upon the environment (i.e. Pressures such as urban congestion or Responses such as environmental improvement projects). See Appendix A for more detail.
- **Technical assessment** of the environmental data to identify the priority environmental challenges in the city and the context of the interdependencies within which they arise.

II. Green City Action Development

Building off the Green City Baseline, GAM developed the GCAP for Amman through the following stages:

- The Technical Committee and key stakeholders prioritised the challenges identified in the technical assessment during the **Challenge Prioritisation Workshop**. Additionally, they developed the City of Amman's long-term **Vision** and medium-term **Objectives** to guide the GCAP.
- A team of technical specialists formulated a **set of over 200 actions** that GAM could implement to address their prioritised challenges.
- The Technical Committee and key stakeholders shortlisted these actions during the **GCAP Action Prioritisation Workshop**, which were then approved by the Steering Committee.
- The team of technical specialists further developed these actions to inform a **final round of consultations** with the Steering Committee and Mayor, leading to the full list of short-term actions (Chapter 5) and long-term actions (Appendix E) included in this **Green City Action Plan**.

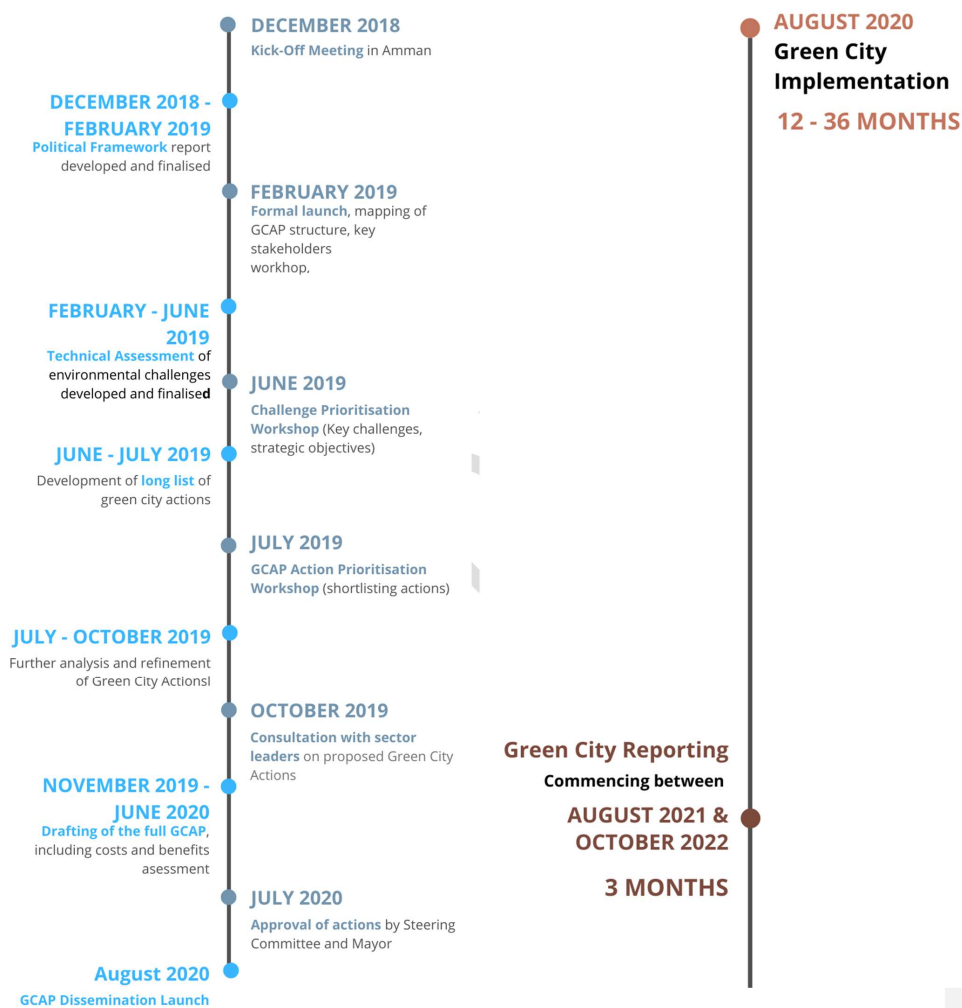
III. Green City Implementation

GAM will operationalise the Green City Action Plan during the **Green City Implementation** phase. Success at this stage requires the commitment of each action owner, as well as Municipal leadership, including allocation of necessary financial and human resources (see Appendix B and C for further detail). Amman is already very advanced in a range of sectors (e.g. water cycle management), and hence some actions documented in this plan are well underway.

IV. Green City Reporting

The GCAP is supported by a detailed **Monitoring and Evaluation Plan** (see Chapter 6), which documents activities that will be undertaken to track implementation progress of GCAP actions, as well as the impact these actions are having on the state of Amman's environment. This document sets the requirements for periodic reporting and follow-up actions that will be taken in response to outcomes of monitoring and evaluation (e.g. modification of actions that have proven less effective than expected).

Figure 2.1. GCAP process



Source: AECOM, 2020.

2.1 GCAP Governance

GAM developed the GCAP for Amman with input and guidance from two governing bodies, the Technical Committee and the Steering Committee.

- The **Technical Committee** was established by decree from the Mayor of Amman. It comprises 23 representatives from relevant sectors covered by the EBRD Green Cities Framework, such as heads/deputies of relevant structural units of GAM, the group provided technical advice and recommendations around Amman's sustainability challenges and opportunities. The Technical Committee was involved in all GCAP milestone deliverables. For the implementation phase, it is recommended to GAM that the Technical Committee transition to the role of the GCAP Coordination Board and continue to provide technical advice and feedback on the delivery of actions.
- The **Steering Committee** was established to provide guidance, oversight and GAM approval of the GCAP. The Steering Committee constitutes senior GAM officials who hold decision-making power (e.g. the Mayor and representatives of GAM City Council) and heads/deputies of Edama, Miyahuna and the Royal Scientific Society. The Committee advised on the overall strategic objectives of the GCAP, ensuring it was aligned with GAM's priorities, provided comments on key deliverables, and approved the final GCAP. They will continue in their advisory role through the GCAP Implementation and Reporting stages.

2.2 Vision

GAM have been working on several different strategies in recent years. Each of these has produced a vision for the city. These are outlined in Figure

Figure 2.2. Existing visions for Amman

City Vision	"Having Amman, a city that is an organized, modern, smart, safe, attractive, lively, friendly, viable, proud of its heritage and its roots".
Amman Resilience Strategy Vision (2017)	"A welcoming, young and diverse city, balancing the old and the new, the progressive and the traditional. Amman promotes a culture of sharing and inclusivity, pioneering regional change".
Climate Action Plan Vision (2019)	"To transform the City of Amman to become a sustainable, green and liveable city that works efficiently to preserve its resources for future generations".
Green Growth Action Plan (ongoing)	"Behind the National Green Growth Plan is a clear vision for Jordan as a country with an expanding and sustainable economy that creates jobs, income for its citizens, and is resilient to external shocks and instability in the region. A country of economic opportunity for everyone that provides decent work and living conditions based on an environmentally sustainable economic growth model".

Rather than produce a new vision, GAM have ensured that the GCAP was developed in such a way that it reflects the social and economic aspirations set out in these visions. These are set out in Figure 2.3.

Figure 2.3 Themes from Amman's existing visions

Amman's vision themes:

- Deliver green growth
- Become organised
- Protect its heritage
- Be attractive
- Promote a culture of sharing and inclusivity
- Be lively but safe and friendly

3. Stakeholder and Public Engagement in Amman

Stakeholder input has been an important feature of the GCAP process in Amman. Stakeholders were identified through a mapping exercise at the start of the GCAP process, the two governance bodies were established, and a Stakeholder Engagement Plan was developed (see sub-section 3.1).

Additionally, a Public Engagement Plan was developed, and a series of pilot engagement activities were undertaken to promote the GCAP, and to establish a standardised public engagement framework for future programmes in Amman (see sub-section 3.2).

3.1 Stakeholder Engagement Process

As discussed in sub-section 2.1 above, at the beginning of the project, GAM established a Steering Committee of political representatives and a Technical Committee of GAM's departmental experts.

Beyond the Steering and Technical Committees, an extensive stakeholder identification process began at the outset of the project. Stakeholders included representatives from municipal government agencies, research centres, academics, embassies, civil society groups, Jordan-based companies, national government agencies, international NGOs, donor agencies, and International Financial Institutes. In total, nearly 275 unique stakeholders were identified and included in the Stakeholder Engagement Plan.

Stakeholders were invited to participate in five engagement stages:

1. December 2018 - Kick-off meeting (KOM)

The KOM was held in December 2018 as part of the inception mission to commence the GCAP process. The KOM included GAM officials and donor agency representatives. The objective of this event was to provide an introduction to the GCAP process and the key steps. In addition, the KOM provided stakeholders an opportunity to map key environmental constraints, identify existing projects the GCAP should consider and suggest potential actions and initiatives. Furthermore, stakeholders participated in a roundtable discussion to voice their perceptions of the key issues and drivers behind Amman's environmental strengths and challenges, and which indicators they felt were a priority focus. Finally, the KOM provided the opportunity to identify further stakeholders who should be involved in the process.

2. February 2019 - Launch event

The official launch event was held on the 25th February 2019 to publicly announce the GCAP launch and to make the GCAP a political priority. Speakers included H.E. Dr Yousef Shawarbeh, the Mayor of Amman; Susan Goeransson, the Director for Municipal and Environmental Infrastructure for the EBRD; Eng. Ibrahim Subhi Al-Shehadeh, Jordan's Minister of Agriculture and Environment, and Dr Oskar Wüstinger the Austrian Ambassador to Jordan.

There were two stakeholder engagement activities included as part of this event: (1) an online poll and (2) a half-day stakeholder workshop which included the following activities: (a) what does a green city look like? (b) what's important for Amman's GCAP? (c) review of existing GCAPs and (d) further stakeholder identification.

Online poll: At the end of January 2019, GAM uploaded an online poll to their Facebook page, asking the public four key questions to identify what a green city means to Amman's residents, to which over 400 residents responded (see Figure 3.1). In summary, the residents all agreed that a greener city would be of benefit to them, that Amman is not currently a 'Green City' and that trees, plants and open spaces, clean air and improved 'walkability' were key criteria for a greener Amman.

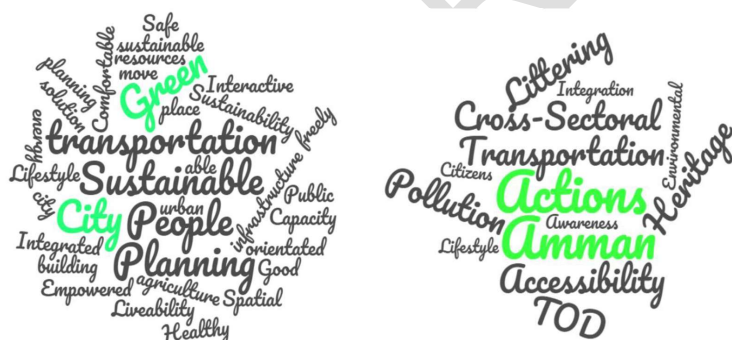
Figure 3.1. Results of the January 2019 online poll

What does a 'Green City' mean to you? Top 5	What do we need to do to make Amman a greener city? Top 5
<ol style="list-style-type: none"> 1. Lots of trees, plants and open spaces 2. Clear air 3. Easy to walk or cycle 4. Clean streets 5. Clean water 	<ol style="list-style-type: none"> 1. More trees/open space 2. Improved walkability 3. Better public transport 4. Improve building efficiency 5. Reduced cars
Is Amman already a 'Green City?'	Would making Amman a greener city benefit you?
Completely disagree 40.7% Disagree 40.7% Neutral 3.7% Agree 3.7% Completely Agree 11.1%	Yes 100% No 0%

Half-day stakeholder workshop: This workshop actively engaged GAM employees from a wide range of departments to gather their views and ideas, which would assist in the preparation of the GCAP. The event was split into several activities:

- What does a green city look like?* The objective of this initial session was to get participants thinking about what a green city means to them, and what key actions Amman needs to focus on to become a 'Greener City.' The words in Figure 3.2 capture the key focus areas.

Figure 3.2 Left: What does a 'Green City' mean to you? Right: What do we need to do to make Amman a greener city?



Source: AECOM, 2019.

- What's important for Amman's GCAP?:* The objective of this activity was to identify what the group thought is important to include in the Amman GCAP, based on what works well in Amman. This was done through a review of existing GCAPs from three other cities. Participants used these GCAPs for inspiration in highlighting: elements of the GCAP process that are most important to the Amman context, reporting style and structure that would work well in Amman; and other GCAP Priority Environmental Challenges (PECs) that were also relevant to Amman and types of actions that could address them. The outcome of this exercise fed into the structure and approach to this GCAP.
- Stakeholder engagement:* The objective of this session was to understand who should play a role in the development of the GCAP. To ensure all relevant parties were captured, a group exercise was designed to identify not only which stakeholders needed to be engaged, but their level of influence verses level of interest, and in which way they should be engaged. This exercise was the foundation of the development of the stakeholder engagement plan that coordinated all engagement activities throughout the development of this GCAP.

The key takeaways from the event were that the stakeholders generally agreed on the importance of addressing quality of life, economic equality, and green issues together. They identified goals and targets on crossover issues such as improving

community awareness of the importance of building a green city and creating a vision for a more prosperous, accessible, liveable and sustainable city.

3. Prioritisation workshop

In June 2019, a full-day prioritisation workshop, with approximately 25 participants, was held with the Technical Committee to review and agree on the highest PECs in Amman (see Chapter 4 for further details).

This workshop included the following engagement activities:

- Review of Amman's Existing Visions and development of strategic objectives:* As mentioned in sub-section 2.2, Amman already has many existing visions and objectives (e.g. City Vision, Resilience Strategy Vision, Climate Action Plan Vision). In this session it was decided that the GCAP did not need an additional vision to shape the PECs. The PECs should, however, relate to environmental issues that underpin the objectives of the existing visions. As such, these visions were distilled into their core elements and used as prioritisation criteria for identifying the most pressing environmental issues. Following the identification of vision themes, the Technical Committee developed a set of strategic objectives to guide the action development phase.
- Validation of the Technical Assessment:* This activity aimed to validate the indicator data and key conclusions of the Technical Assessment. It included an extensive discussion about the robustness of data collected and strategies to ensure actions were based upon the best available information. The conclusion of the Technical Assessment outlined a long list of environmental challenges, based on the state of the environment and pressures acting upon it, which the group debated and refined.
- Identifying Amman's PECs:* Drawing on the long list of environmental challenges, the workshop focused on prioritising which challenges were most pressing to address in relation to meeting the objectives of the various Amman visions. The outcome of this session inputted into the formation of the PECs set out in Chapter 4.
- Development of strategic objectives:* Following the previous stakeholder engagement activities, the Technical Committee developed a set of strategic objectives to address the PECs in a way that supported Amman's vision themes. These strategic objectives are set out in each sector-specific sub-section of Chapter 5.

Figure 3.3. Prioritisation Workshop



Source: AECOM, 2020.

In addition, a stakeholder roundtable event was held with external stakeholders (including civil society organisations, academia and the private sector), in order to validate the findings of the Technical Assessment and identify any gaps or priority areas that stakeholders wanted to see reflected in the action development phase.

A donor coordination meeting was also convened at this time (see Box 1).

Box 1. Donor Coordination Group

Early on in the GCAP process, donor agencies recognized the benefit to have a monthly **donor coordination meeting** to ensure that all agencies were up-to-date with the programmes and actions that each were undertaking. This was especially crucial because this GCAP aims to aggregate and build on past, existing, or planned projects and programmes that these organisations have established.

4. Policy and Action Workshop

In July 2019, two workshops and one stakeholder roundtable were held to gain further recommendations on potential actions to be included in the GCAP, in response to the PECs developed in the June 2019 workshop, and to establish a short-listing criterion to prioritise the potential actions.

Workshop 1: The first workshop was split into the following activities:

- 1) *Long list validation:* The objective of this task was for Technical Committee members to validate a long list of potential actions developed to address the PECs, identify gaps and note actions that they deemed unfeasible or useful in the context of Amman.
- 2) *Developing a shortlisting criterion:* The objective of this task was to develop criteria against which to reduce the long list of potential actions to a prioritised shortlist against the four pillars of sustainable development: environmental, social, economic and institutional. Ultimately, the following criteria list was developed (see Table 3.1).

Table 3.1. Short-list criteria developed during the July 2019 workshop

Environment	Social	Economic	Institutional
Climate change mitigation	Action will improve the public realm	There is a clear avenue to finance the action	The action will support coordination across departments
Action will help Jordan achieve Intended National Determined Contributions (INDCs)	Action will improve access to public services	Economic returns for investor	Action will improve the staff capacities
Protection of natural resources	Action will improve safety	Action promotes economic inclusion	Action will enhance the legislative environment
	Action will promote equality		

Stakeholder Roundtable: 47 different organisations attended the stakeholder roundtable with representatives spanning non-profits, educational institutions, private sector, and research organisations; with the objective of allowing external GAM stakeholders the opportunity to provide insight into the GCAP process. Furthermore, the stakeholders were able to critique and expand on the shortlisting criteria drawing on their work in Amman and their previous partnerships with GAM.

Workshop 2: During the second workshop, the Technical Committee reviewed the shortlist that had resulted from applying the shortlisting criteria. While the shortlist indicated that, by and large, the shortlisting criteria reasonably matched how participants expected the actions to be prioritised, some lower priority actions were reassessed as having a higher priority.

Finally, a donor coordination meeting was held to coordinate with International Non-Government Organisations (INGO) and International Finance Institutions (IFI) working in Amman, and start to map out existing and proposed projects to be incorporated into this project.

5. Sector lead meetings

Following the July 2019 workshop, the potential actions were further developed, and in October 2019 dedicated meetings were held with the GAM department officials that would be responsible for the relevant actions (who were called sector leads). Meetings were held with the following departments:

- Environment and Solid Waste Development
- Public Facilities and Gardens Directorate
- Social Media Team
- Cultural Department
- Engineering Directorate
- Planning Directorate
- Execution Department

Through the meetings and follow up correspondence, the sector leads helped further refine the actions to identify those which were most feasible and impactful in Amman.

Additionally, follow up meetings were held with the City Manager, the Steering Committee, Ministry of Environment and Jordan Climate Fund to gather feedback and comments on the draft actions. In addition, another donor coordination meeting was held to update the INGOs and IFIs on the progress of the GCAP and to receive their updates to ensure alignment of ongoing projects with the actions proposed in the GCAP.

3.2 Public Engagement Process

The Public Engagement process included two phases. First was the development of a Public Engagement Plan (PEP) which is a communication tool for GAM and includes a series of pilot engagement activities. The second phase includes a city-wide roll out of effective public engagement measures focused on the GCAP. The first phase has been completed and the second phase will commence following the publication of the GCAP.

3.2.1 Phase 1: Public Engagement Plan

To promote the GCAP and other environmental projects, a comprehensive Public Engagement Plan (PEP) was developed to understand the experience of Amman's residents in relation to environmental projects and their understanding of GAM's work in these areas. The Public Engagement Plan includes a methodology for engagement that GAM can use to inform existing or future development of plans, strategies and policies. The plan also identified different engagement tools that could be used across Amman, some of which were trialled as part of the pilot engagement activities detailed below.

Public Engagement Plan

The development of the PEP included a desk-based review, 12 interviews with GAM employees, interviews with members of the public, an online survey, four focus groups, one validation workshop, one high-level meeting with the City Manager and his assistants to share findings. Based on this, a SWOT analysis was conducted to identify GAM's strengths, weaknesses, opportunities, and threats in relation to their existing public engagement (see Table 3.2).

Table 3.2. SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> Leadership support Dedicated team Reach (the number of residents who see messaging) 	<ul style="list-style-type: none"> Green communication strategy and framework Internal communication Bureaucracy
Opportunities	Threats
<ul style="list-style-type: none"> Create positive perceptions Creativity in engagement Approach in engaging residents Affiliation and partnerships Internal transformation 	<ul style="list-style-type: none"> Public perceptions Response capacity and timeliness Internal resistance

Pilot Engagement Activities

Phase 1 included four pilot engagement activities all focused around the campaign title of 'Amman Bel Akhdar | بالأخضر عمان | Amman in Green': FADFED³ Engagement Activity, Campaign Mural and Green Amman Contest and Amman in Green Online Campaign. The activities were developed based on the findings from the Public Engagement Plan. The purpose of the activities was to pilot and sample different engagement methods within Amman, which then informed the development of the GCAP city-wide engagement activities (Phase 2). The activities were also used as a platform to gather information

³ FADFED is a slang Arabic word which means "Let it out". It is a research methodology developed by Leaders of Tomorrow that involves hanging large blank pieces of paper in public or private venues to collect opinions on specific topics. See: <https://www.fadfed.org/>

and feedback from the public that further informed the development of the GCAP. The details of each activity are provided below.

1. FADFED Engagement Activity:

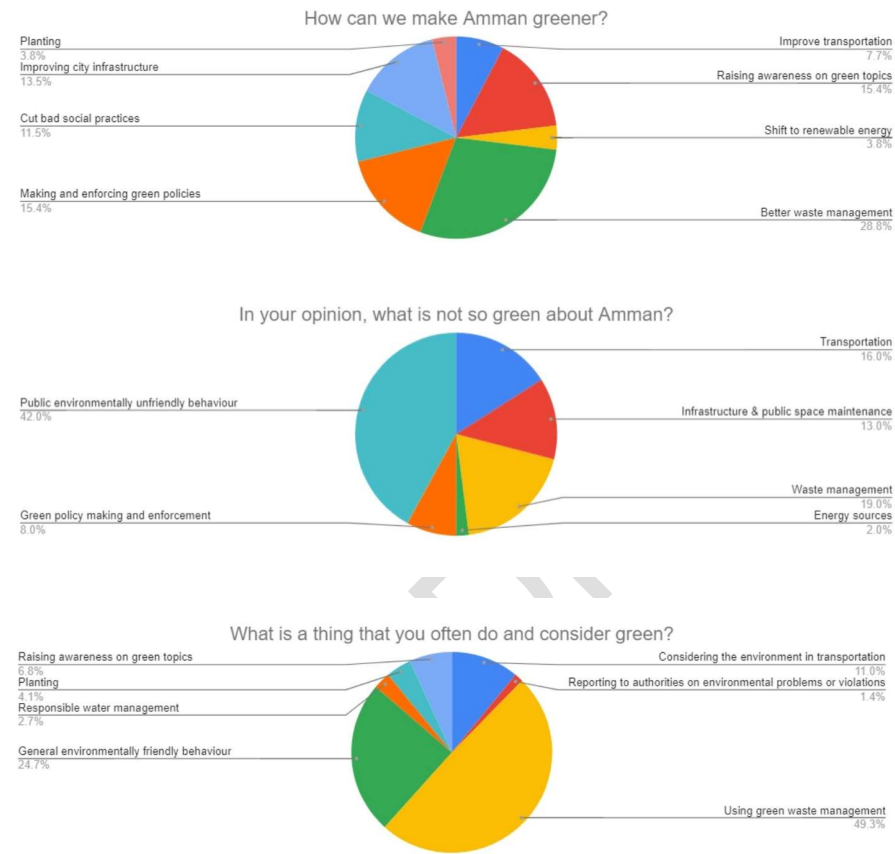
Figure 3.4. FADFED event near Rainbow Street, Amman



Source: LoT, 2020

On the 28th and 29th of February 2020, the "Speak it Out" FADFED engagement activities were undertaken. This involved placing sheets of paper on prominent walls near Rainbow Street and Jabal Al Ashrafiyeh and inviting individuals to write their responses to a series of questions (See Figure 3.4). The activity generated 225 responses from 209 participants. These findings were considered in the development of the GCAP actions.

Figure 3.5. FADFED Event Responses



2. Campaign Mural:

At a central and visible location on Rainbow Street, a mural was designed that represents the vision themes⁴ for a greener Amman (see Figure 3.6). This mural is linked to the Green Amman Contest discussed below. It has become a hotspot at Rainbow Street with many citizens seen to stop and take pictures with it.

Figure 3.6. Campaign Mural at Rainbow Street



Source: LoT, 2020

3. Amman in Green Online Campaign:

The Amman in Green campaign was launched on Saturday, 8 August 2020, and ended on Saturday, 22 August 2020. The campaign included a series of engaging posters covering the following:

- International examples of green cities and green initiatives;
- Success Stories from Amman of people maintaining green lifestyle; and
- Green practices you can do in daily life

The campaign gathered stories of existing green practices and raised awareness on the benefits of adopting an environmentally friendly lifestyle. The campaign included posters, videos, and other engaging content that was shared through a dedicated 'Amman Bel Akhdar | بالأخضر عمان | Amman in Green' Facebook page. Other supporting platforms shared the content of the campaign, they were: GAM social media outlets^{5, 6}; Leaders of Tomorrow Facebook page⁷ and FORSA Facebook page⁸. A sample of posts and their accompanying text have been set out below. The campaign reached nearly 500,000 people, with approximately 30% of those between the ages of 18-34. There were over 27,539 engagements.

⁴ See Figure 3 for the Amman GCAP vision themes

⁵ <https://www.facebook.com/cityofamman>

⁶ <https://twitter.com/GAMtweets>

⁷ <https://www.facebook.com/leadersot>

⁸ <https://www.facebook.com/for9a>

	<p>Stockholm, Sweden</p> <p>Stockholm is one of the eco-friendliest cities in the EU. It was the first EU city that won the European Green Capital Award in 2010. The city aims to become completely fossil fuel free by 2050. Stockholm already has a well-laid system that keeps it running without using massive fossil fuel reserves.</p> <p>At present, Stockholm has biofuel conversion plants that take sewage to produce biofuel from them. The city is also working on another project that utilizes wasted heat produced by data centers, stores and stadiums to use it in providing heating for the citizens of Stockholm.</p> <p>In your opinion, how can Amman reduce its dependency on fossil fuels?</p> <p>#AmmanInGreen</p>
	<p>Green Building</p> <p>Also known as Sustainable Building, that functions to reduce the environmental effect in a whole process that starts with designing the scheme, building, operating and maintaining, and demolition at last. Green buildings have many advantages including:</p> <ul style="list-style-type: none"> Focusing on the relation between the environment of the building and that of the surrounding nature. Reducing the energy consumption of heat and air conditioning. Generating the energy needed to operate the building and share the remaining with local networks. Reducing water wastage. Providing a healthier environment inside the building. Using materials that are more effective in insulation and construction. Having less impact on the surrounding environment. Reducing the amount of produced waste. <p>What sustainable/green features should Amman's buildings possess?</p> <p>#AmmanInGreen</p>
	<p>Have you ever placed plant pots on your house roof?</p> <p>Participate in the Amman in Green challenge. Write a post on your page on how we can make a better use of house roofs in Amman.</p> <p>Include the campaign's hashtag #AmmanInGreen. Mention us, and make the post public so that we are able to view it to have you participate. The first ten posts with the highest number of likes will enter the withdrawal process which enables three participants to win! Each of the winners will get:</p> <ul style="list-style-type: none"> Subscription at GOLD'S GYM - Abdoun Branch One night stay trip for two people at Ajloun Forest Reserve Dinner for two people at Wild Jordan Restaurant in Jabal Amman Collection of handmade products from Souq Fann <p>Post it. Make it public. Include the hashtag. Mention us. And tell your friends to like it so that you can win. Last date to participate is 20/08/2020. #AmmanInGreen</p>

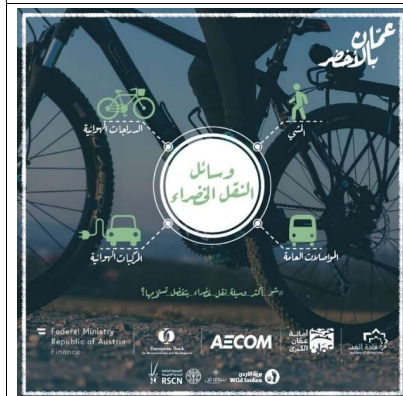


Green Cities

Also known as sustainable cities or eco-cities, which are designed with consideration for social, economic ,and environmental impacts, while maintaining a resilient environment for existing inhabitants.

The inhabitants of green cities seek to reduce the consumption of inputs from (energy, water, food) and outputs from (heat, air and water pollution). Green cities are concerned with the environmental aspect in its design in the sectors of energy, water, transportation, waste and construction.

What is missing in Amman to become an eco-friendly city?
#AmmanInGreen



Green Transportation







Any mode of transport that has a reduced impact on the environment is considered a green mode of transport. This includes walking, cycling, non-mechanical transport, electric vehicles and organically fueled vehicles.

Modes of transport are considered "Green" depending on the increased efficiency of fuel consumption against the number of consumers, while cities architecture and urban planning contribute to increasing the efficiency of green transport and decreasing the number of harmful vehicles.

Transportation contributes to 20 - 25 % of the world's energy consumption and carbon emissions, while road transport contributes directly to the pollution of local air, fog and smoke.

What are the most suitable green modes of transport in the city of Amman?
#AmmanInGreen

Figure 3.7 Responses from the Public Engagement Online Campaign and how they relate to the GCAP sectors and GCAP actions

GCAP Sectors		Public responses to online campaign questions	Action Code
 Efficient and resilient energy systems and buildings	→	Simplify the process and regulations of installing and using solar cells at homes and small businesses	EB6
		Producing energy from biowaste	SW5
 Accessible, diverse and low carbon mobility systems	→	More friendly sidewalks with better designs and fewer obstacles	T2
		Implementing digital solutions for all public transportation	T3
 Resource efficient and holistic waste management systems	→	Raising awareness of the importance of recycling	SW1
		Implementing waste sorting policies and providing the appropriate containers for it.	SW8
 Integrated water resource management	→	Rooftops for water tanks, and rooftop planting can significantly contribute to reducing water waste by utilising grey water for watering plants	W4 W4.1
 Comprehensive and reflective land use planning	→	Reusing unused facilities such as King Abdullah Park, old railway, Amman Gate towers, and other abandoned locations.	LU7
		Increasing the green areas in the streets and unused areas.	LU1
 Responsive and forward looking climate adaptation policies	→	Activating more environmental laws and regulations.	CA6
		Including ecological activities, curriculums, initiatives, and volunteer work in schools and universities.	CA2

4. Green Amman Contest:

It was initially planned that the Green Amman Contest would run for all of July 2020 and citizens would be encouraged to take pictures with the mural, post them onto their social media platforms (Twitter, Instagram and Facebook) and identify at least one green practice they do in their daily life. Three winners would be selected based on the top posts that generated the highest number of likes and received a 'Green Pass' which represented an 'environmentally friendly' voucher. However, given the restrictions and concerns around COVID-19, the contest was adapted to reduce the need to go out in public to participate in the contest. Instead the contest was integrated into the Amman in Green Online Campaign. Members of the public were encouraged to respond to thought provoking posts on their social media accounts about sustainability issues in Amman and how to make it a 'eco-friendlier' city. The top ten posts with the highest number of likes entered into a draw to win a series of prizes. Overall each winner won:

- Three-month subscription at GOLD'S GYM - Abdoun Branch⁹
- One-night stay trip for two people at Ajloun Forest Reserve¹⁰
- Dinner for two people at Wild Jordan Restaurant in Jabal Amman¹¹
- Collection of handmade products from Souq Fann¹²



Source: AECOM and LoT, 2020.

In total, 50 people participated in posting about their experiences and suggestions about how to improve Amman's sustainability. The three winners are shown in Table 3.3 and their posts are on the following page.

Table 3.3 Contest Winners

Name	Gender	Likes
Merna Hanaa	Female	114
Rawan Ahmad	Female	101
Natali Assaf	Female	71

⁹ <https://www.goldsgym.jo/>

¹⁰ <https://www.rscn.org.jo/>

¹¹ <http://wildjordancenter.com/>

¹² <https://souqfann.com/en/>

Merna Hanaa's participation

I went to a lecture one day, and the lecturer showed us a picture of garbage covering the surface of a river and commented on its harmful effects and told us that "we are all going to die", and explained the impact of garbage on the weather and how the average global temperature is rising and putting Earth in danger.

When this person said this, I immediately remembered how my daughter looked on our way to her kindergarten a morning when she was smiling and the first idea that came to my mind is that I want a decent future for her. I started thinking how I can control the waste that my house produces, but I was faced with two problems:

The first problem: supermarkets and the community do not easily provide reusable alternatives that you can use again when shopping.

The second problem: the lack of separated waste containers in each residential area.

I suggest that each area has a waste container specified for different types of waste and for it to be easily accessible within a walking distance. This would help in creating a visual contact for the residents which will encourage them to separate their waste.

Rawan Ahmad's participation

Support us with a like even if it's a tough one.

For a city to be green, that is a collective result of balanced environmental and healthy years. We wish to contribute to making our capital Amman a green city.

One of the ideas that can significantly and noticeably contribute to this is rooftop planting. It is commonly known that rooftops are only for water tanks. Therefore, this step would be a huge improvement. What makes it easier is the ability to reduce water waste by utilizing grey water for watering these plants.

#AmmanInGreen

Please do not use water from other people's tanks with the excuse of watering these plants.



Natali Assaf's participation

Don't throw garbage on the floor just because you noticed it was dirty, and when you go on a trip bear in mind that you are not in a garbage swallowing land and it shouldn't be okay to throw your bags of chips, food, cans, and your child's diapers on the ground!

Also, don't throw your cigarettes between the trees just because there are other 60 cigarette buds laying around.

There is an invention called charcoal starter that costs 1 JOD and can be used when you go for a barbeque instead of taking down what is remaining from the trees in Jordan.

And it's alright if you don't leave the stove on after others chose to do the opposite.

Don't live by the principle of "If they do it, I do it". You are not the son of others and nor are they your role model.

When you try to aim your garbage bag at the container and you miss, don't ignore it. It is not a ball and you are not in a playground.

It is perfectly fine to have a decent principle that you stick to and it would be nice to have your own awareness despite what others do.

#AmmanInGreen



3.2.2 Phase 2: City-wide engagement activities

The second phase of the Public Engagement project will develop a series of activities to focus on promoting the GCAP and engaging the public with it. There will be five rounds of engagement activities that will be rolled out across the city from October 2020 to the end of November 2020. The activities have been summarised below:

- **1. Awareness Raising Campaign:** This will be an online campaign that will build on Phase 1 and will aim to engage the public in the concept of a Greener Amman, through gathering stories of their own green practices and raising awareness of local and international approaches to sustainability. The campaign will also take the opportunity to promote the engagement activities that will follow up as part of Phase 2. **Estimated: September 2020**
- **2. DIWANIEH:** Diwanieh is a public engagement platform that utilises public spaces to engage citizens in the decision making process, through encouraging debate and dialogue in public spaces. LOT has significant experience delivering public debates across Jordan and they will use this experience to engage the public and develop a discourse around the GCAP. As such panel discussions and/or a debate will be organised which will cover environmental and sustainability issues. It is expected that this event will be open to 70-120 participants from different socio-economic backgrounds in Amman. **Estimated: November 2020.**
- **3. MOHAKA:** Mohaka is a two day immersive course that seeks to use innovative role-playing techniques for learning, breaking down social barriers and challenges taboos. The workshops occur in remote locations such as nature reserves to draw people out of the everyday stresses of life. It has been proposed that 16-20 participants will be selected from GAM personnel and members of the public. The participants will be from different socio-economic backgrounds and the programme will cover environmental and sustainability topics that help improve the lifestyle of the participants and their communities. The topics will tie into the Amman GCAP Actions where applicable and will draw on the findings from the technical assessment conducted as part of the Amman GCAP Project. **Estimated: September 2020.**
- **4. Training Workshop:** A two-day training workshop for 12-16 participants will be organised that aims to improve the knowledge of the citizen of Amman about environmental issues in Jordan and Amman. The aim of this activity is to create ambassadors for green practices among different groups in Amman. It is envisioned the training will include facilitators who are environmental activists from the community to ensure the participants learn from their experiences and hear the challenges they face. Social media will be used throughout the two-day workshop to promote and share ideas through a tailored hashtag. **Estimated: October 2020.**
- **5. Reporting and Presentation:** A presentation will be delivered to GAM, EBRD and external stakeholders (participants of the activities) which will present the results of the engagement activities. An engagement report will be developed for EBRD which will include a summary of all engagement activities and key findings. **Estimated: November 2020.**

Part B: Amman's Green Baseline



4. Summary of City and Environmental Context

This chapter provides an overview of the regulatory and legal frameworks within which the GCAP for Amman sits. It also summarises the priority environmental challenges facing Amman. A full discussion of the state of the city's environment and the pressures acting upon it are set out in Appendix A. The city and environmental context establishes the foundation upon which the GCAP actions were built. It highlights that the rapid growth of the city, combined with its spatial layout and car-dependent transport are key pressures that are detrimentally impacting air quality and greenhouse gas (GHG) emissions in the city. Additionally, the spatial layout lacks adequate green and open spaces for residents which has implications for biodiversity, urban heat island and flood risk, and the general well-being of Amman's residents. Finally, Amman remains a water-stressed city that must ensure adequate service delivery to its expanding population and, as such, water availability and supply remain critical issues that will be a focus of this GCAP.

4.1 City Context

Amman is the capital city of the Jordan. The city, located in the North West of Jordan, is in a strategic position at the crossroad for different trade routes in the region, including industrial and commercial activities, banking, and educational institutions. In 2018, Amman's population was recorded at 4.4 million people,¹³ 43 percent of Jordan's total population.

Amman is divided into two major sections; East Amman and West Amman. East Amman is the older part of the capital which contains the majority of the city's historic and cultural sites and is occupied mainly by single family dwellings on the hill sides, with small shops and bazaars in the wadis.¹⁴ West Amman is less densely populated and is considered the more prosperous part of the city. West Amman is also where much of the city's economic activity happens and where the city's 5-star and 4-star hotels are located. An evident division exists between the more affluent districts of West Amman and the lower socio-economic districts of East Amman. This is demonstrated by the discrepancy in infrastructure. West Amman, for example, has significant road infrastructure including the iconic eight circles that connect the districts. This road infrastructure also promotes traffic and congestion, which have detrimental impacts that will be discussed further in sub-section 4.3.

4.2 Governance Context Relevant to the GCAP

Management of environmental assets (air quality, water use and quality, green space, biodiversity, GHG, and climate change risk) and sectors (transport, buildings, water cycle management, industry, energy, solid waste, and land use) that place pressure upon it are regulated by a wide range of actors. Understanding the relative role and priorities of these actors has a bearing on the scope of the GCAP and the stakeholders involved in its successful implementation.

GAM is ultimately responsible for the implementation of the GCAP. GAM was established in 1987 with the approval of the Jordanian Parliament and was intended to centralize urban planning decision-making into one institution, while preserving local representation.

The Mayor of Amman is appointed by His Majesty the King. The Mayor, currently His Excellency Yousef Shawarbeh, leads the City Council, which is made up of 44 members; half of which are elected by districts, while the other half are appointed by His Majesty the King.

The City Manager has executive responsibility for the on-going management and control of the Municipality. This is further managed by six Deputy Mayors with responsibility for:

- Public Services Sector, with directorates covering:
 - Public transport
 - Traffic planning
 - Road maintenance
 - Public facilities and gardens (open spaces)
 - Fleet maintenance
 - Engineering

¹³ The World Bank. 2018. Jordan Urban and Municipal Program for Balanced and Inclusive Growth

¹⁴ Wadi is the Arabic term that refers to dry valleys that may be filled by ephemeral streams/rivers.

- Districts and Environment, with directorates covering:
 - Solid waste management
 - Construction inspections
 - Environmental licencing
- Health and Agriculture, with directorates covering:
 - Agriculture and forest management
 - Health inspection
 - Management of public markets
- Community Development, with directorates covering:
 - Cultural affairs
 - Sports and entertainment
- Planning and economic development, with directorates covering:
 - Planning, master planning and zoning
 - Building control and licensing
- Finance and Administration in charge of financial control and the municipality's revenues and expenses.

This GCAP identifies relevant action owners from the GAM directorates and indicates where coordination with National Ministries is needed. Table 4.1, outlines key ministries within the national government that are relevant to the GCAP.

GAM will be implementing the GCAP in accordance with national legislation and policy. As a result, national government is a key stakeholder in the delivery of the GCAP. The GCAP will need to adhere to national directives and actively involve, where appropriate, national government departments in its proposed delivery.

Table 4.1. Key National Ministries relevant to the GCAP

National Ministry	Description of Responsibilities
Ministry of Environment (MoEnv)	Established in 2003 with the mandate of maintaining and improving the quality of the environment in Jordan. In accordance with the Environment Protection Law No. 6 of 2017, MoEnv is responsible for the overall protection of the environment and its ecosystems by setting the strategic policy framework and enacting legislation and enforcement, through licensing, monitoring and inspection. MoEnv is also responsible for promoting environmental culture (behavioural change), enhancing environmental monitoring, and transitioning Jordan to a green economy.
Ministry of Health (MoH)	MoH is responsible for public and environmental health in Jordan. It has the power to take any necessary action or protocol to ensure the implementation of laws and health standards. The MoH is given the authority to offer preventive and treatment medical services, environmental health management, license and supervise all public and private health establishments, and provide public health insurance. The MoH, through a special Directorate of Environmental Health, focuses on air quality, pest control, industrial and medical emissions and effluents among many other aspects of environmental health.
Ministry of Agriculture (MoA)	The MoA is responsible for regulating the agricultural policy for Jordan, managing the agricultural sector and improving the status of farmers. In addition, the MoA are responsible for controlling, organising and legalising the use, import, and export of pesticides and fertilizers used in the agricultural sector. This Ministry is important for the GCAP as most of the city's growth in the last 30 years has taken place on agricultural land to the west of the city. This has resulted in complex and

National Ministry	Description of Responsibilities
	conflicting development between industrial, agricultural and urban zones.
Ministry of Transport (MoT)	The MoT is mandated to develop general transport policy and supervise its implementation in coordination and collaboration with the relevant entities. It regulates, licenses, and monitors road and rail freight transport sector and services. GAM, however, has responsibility for implementing policy around transport planning, road maintenance and public transportation.

Given the context of national governance of legislation and policy, Table 4.2 sets out the jurisdiction and autonomy GAM has in managing environmental assets and pressures within its jurisdiction. This has helped shape the GCAP to target areas where GAM can use its role to assert greatest influence to impact change.

Legend for Table 4.2

GAM's level of influence	
High	Has full autonomy to set policy and/or make investment decisions.
Medium	Has autonomy to set policy and/or make investment decisions around some aspects only; or Has the capacity to make investments but must comply with policy set by the Autonomous Republic of Adjara or National Government actors.
Low	No autonomy to set policy and/or make investment decisions. The City's main vector to influence policy and investments is advocacy.

Table 4.2. The level of jurisdiction of GAM over key environmental indicators

Indicator	Local Governance Arrangements
Air Quality	The national government rather than GAM holds responsibility for setting air quality standards; however, GAM can take measures to achieve the standards. GAM can influence transportation planning, public transportation, green buildings, use of renewable energy, and green areas within its jurisdiction.
Climate and Disaster Risk	In 2017, GAM developed the Amman Resilience Strategy, and as part of C40 Cities, Amman has committed to delivering net-zero emissions and climate resilience by 2050. Additionally, Amman recently released its Climate Action Plan. Municipalities Law No. 29 of 1955 and its Amendments enable GAM to instigate disaster risk management (DRM) precautions within new constructions. The Municipalities Law No. 14 of 2007 provides responsibilities to GAM to address issues and concerns that include city plans and buildings, sanitation and health, fires, flooding, aid to victims, risk prevention, and financial requirements.
Biodiversity	There are no enforced standards around biodiversity that the national government enacts, but GAM has significant scope to address biodiversity in their own activities. GAM has no specific structural unit for implementing environmental activities related to biodiversity. GAM's Agriculture and Forest Directorate is responsible for controlling and managing green areas and parks as well as ensuring agricultural areas are managed in line with national legislation.
Greenhouse / Climate Change	GAM has no greenhouse emissions reduction strategy, although the recently released Climate Action Plan (see Table) sets the groundwork for mitigation. Specific activities carried out by GAM includes the conservation of water and electricity, the implementation of building control and the Guidelines for Green Buildings and provision of incentives to Amman citizens to implement the Green Buildings criteria.

Indicator	Local Governance Arrangements
Soil	GAM does not have any Amman-specific policies or strategies for contaminated land or strategies for combatting desertification. There are also no clear standards that GAM or the national government has set regarding these areas.
Water Supply, Sanitation and Drainage	Water supply and sanitation are implemented through three governmental companies. Miyahuna Water Company is responsible for water supply networks and wastewater treatment plants in Amman, Zarqa, and Madaba. Surface drainage and rain water management are the responsibility of GAM.
Buildings	Building codes and incentive structures are set at the national level, but GAM is responsible for granting building licenses, monitoring construction and destruction of buildings and elevating design according to GAM requirements. GAM is also responsible for producing a new master plan using the Regulation of Buildings and Zoning of Towns and Villages No.136/2016.
Industries	Industrial zones are classified through the Amman Building and Urban Regulation (2011). GAM is responsible for enforcing industrial zones and providing permit of operation for any industry or craft within Amman.
Energy	The National Electric Power Company is responsible for the distribution of electrical power within the Amman area among others. City level governance has little influence over national grid policies, however GAM has encouraged solar power use, by creating and sharing a Solar PV Rooftop Guideline.
Land Use	The Deputy City Manager for Planning and Economic Development is responsible to the Planning Directorate and Licences (buildings) Directorate within GAM. These directorates are responsible for master planning, urban zoning and building permitting respectively through the Amman Building and Urban Planning Regulation of 2011.
Transport	GAM is responsible for local road maintenance and public transportation services within its boundaries. It includes a design department that implements 'standard' public realm designs.
Solid Waste	GAM is fully responsible for municipal solid waste in Amman, including collection, transportation, and disposal. The regulation "Prevention of Health Nuisance and Waste Collection Fees within GAM Areas no. 150/ 2016", regulates the collection, management, transfer, recycling, treatment and disposal of waste with the approval of the GAM council.

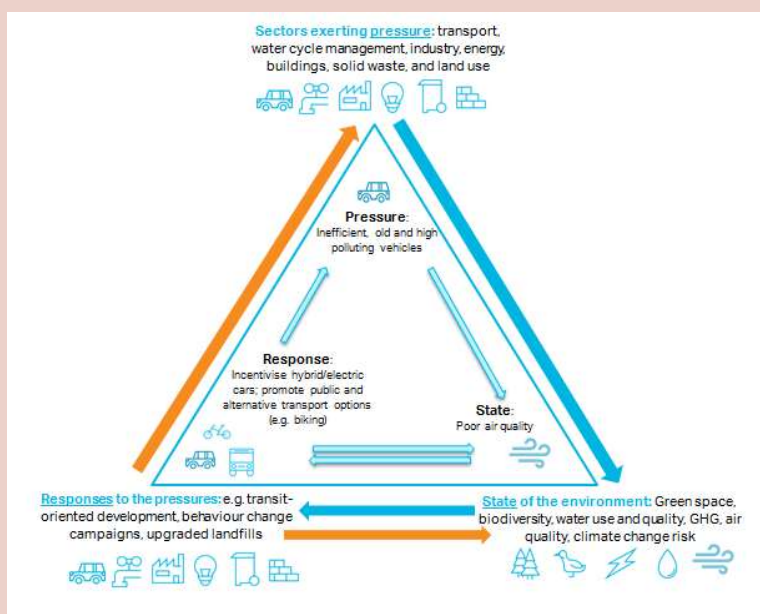
4.3 Environmental Baseline of Amman

This section provides a summary of the state of Amman's environment, the pressures impacting the environment, and the current responses that are being taken to address these pressures and improve the state of the environment.

The baseline conditions of key environmental indicators in Amman were assessed as part of the Technical Assessment component of the Green City Baseline phase of the GCAP. It followed an indicator database developed by the EBRD in partnership with ICLEI and is based on a Pressure-State-Response Framework, which is detailed in Box 2 below. This database consists of 70 core and 114 optional indices which were collected and analysed to inform Amman's environmental baseline.

Box 2. Explaining the PSR Framework

The PSR Framework conceptualises the interactions of different aspects of urban life on the environment. The schematic below demonstrates how state, pressure, and response indicators relate to one another. **State indicators** relate to the quality of an environmental asset (e.g. air quality), the availability of an asset (water availability), or the state of risk (exposure to drought). Note that state indicators include indices on climate and disaster risk. **Pressure indicators** are based on seven sectors and aim to measure how urban activities may adversely impact the state of the environment (e.g. highly congested roads detrimentally impact air quality). **Response indicators** note existing approaches to addressing pressures that are being exerted on the environment.



Source: AECOM, 2019

4.3.1 Development of Priority Environmental Challenges (PECs)

Key state indicators are presented in Table 4.3 with their latest available value. These state indicators were selected out of the 184 indicators because they directly inform the PECs. See Appendix A for a complete list of the PSR indicators and analysis of the state of and pressures acting on the environment. Note that the data is colour-coded according to 'traffic light screening' to reflect high (green), medium (yellow), or low (red) performance compared to pre-defined benchmarks from international standards, EU directives and national laws where applicable¹⁵.

Amman's main environmental challenges centre around poor air quality, lack of sufficient green and open space, and water scarcity. The following PECs¹⁶ were identified from the Technical Assessment. Each action in the GCAP corresponds to one or several PECs, noted by the label (e.g. PEC1). Additionally, stakeholders also prioritised the key pressures contributing to environmental challenges (Table 4.4) as a means to better tailor proposed actions.

Table 4.3. Priority Environmental Challenges identified for Amman

Sector	State Indicator	Latest Value	Pressure Challenges **Summarised priority indicators	Priority environmental challenge
Air quality	Average annual concentration of PM2.5	50	Lu1 Competing land use priorities and pressures	Managing fossil fuel related air pollution through better management of urban transport and energy systems PEC1
	Average annual concentration of PM10	74.32 (average)	Tr1 Lack of public transport infrastructure	
			Tr2 Poor pedestrian infrastructure	
			Tr3 Emissions from gasoline and diesel vehicles	
			Es1 Fossil-fuel dominated energy supply	
Water Cycle** <i>Looking at all water cycle (states and pressures)</i>	No indicator data was available on Amman or Jordan's water exploitation index. Jordan ranks 11 on the top 20 most water stressed countries (extreme risk) (2011). ¹⁷		Es2 Energy and water performance of buildings	Move towards more sustainable water cycle management to reduce impacts of water scarcity PEC2
			Wc1 Hydrological changes due to climate change	
			Wc2 Coverage of sewerage network	
			Wc3 Non-revenue water losses	
Solid waste management	Solid waste trends have bearing on air quality, water quality, and soil quality of immediate surroundings, and also have implications for wider sustainability concerns like inefficient use of resources and land use for disposal.		Wc4 Diffuse urban pollution	Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices. PEC3
			Sw1 Solid waste disposal practices	
			Sw2 Increasing solid waste generation	
Biodiversity	No indicators on biodiversity were available for the PSR indicator database		In1 Industrial solid waste disposal	Delivery of high quality, accessible and biodiverse green infrastructure PEC4
Green space	Open green space area ratio per 100,000 inhabitants	0.73	Lu1 Competing land use priorities and pressures	
			Lu2 Desertification	
			Wc1 Hydrological changes due to climate change	

¹⁵ EBRD. 2017. Green Cities Methodology. London.

¹⁶ Priority Environmental Challenges are the most acute challenges impacting on sustainability in a given city. These challenges are linked to the indicators presented in the EBRD Green Cities methodology. More information is available on the [EBRD Green Cities website](https://www.ebrd.com/green-cities).

¹⁷ https://www.preventionweb.net/files/20129_wsimglobal.pdf

** Pressure challenges were developed from the Technical Assessment and prioritised by the municipal Technical Committee during the June 2019 workshop.

Sector	State Indicator	Latest Value	Pressure Challenges **Summarised priority indicators	Priority environmental challenge
	Share of green space areas within urban limits	3.67		
Climate adaptation and disaster risk	Natural hazards			
	<ul style="list-style-type: none"> Earthquakes Drought Heatwave Epidemics 	<ul style="list-style-type: none"> Floods Transboundary animal and plant diseases Crop pests 	Lu1 Competing land use priorities and pressures	PEC5 Management of increasing urban flash flooding risks
	Climate projections			
	Variable	2040-2059		
	Mean annual temperature	+2.4°C	Lu2 Desertification	
	Mean annual precipitation	-7.4mm		PEC6 Management of intensifying drought and overheating risks
	Total annual hot days above 35°C	34.5 days		
	Severe drought likelihood	0.77	Wc1 Hydrological changes due to climate change	

Table 4.4. Key pressures contributing to environmental challenges in Amman

Land use	(Lu1) Competing land use priorities and pressures (Lu2) Desertification
Solid waste	(Sw1) Solid waste disposal practices
Energy supply and buildings	(Es1) Fossil-fuel dominated energy supply (Es2) Energy and water performance of buildings
Transport	(Tr1) Lack of public transport infrastructure (Tr2) Poor pedestrian infrastructure (Tr3) Emissions from gasoline and diesel vehicles
Water quality and availability	(Wc1) Hydrological changes due to climate change (Wc2) Coverage of sewerage network (Wc3) Non-revenue water losses (Wc4) Diffuse urban pollution
Industries	(In1) Industrial solid waste disposal

4.3.2 Existing Plans and Projects

GAM has advanced several strategies and investments into environmental improvements and sustainability over the past decade. This GCAP complements these existing plans and actions by rationalising priorities, identifying and proposing actions to address key gaps, and help funders assess potential investments. Similarly, the goal is to harmonize these different plans and projects. Table 4.5 outlines key existing plans and projects in Amman and how they relate to the GCAP. Figure 4.1 maps the location of ongoing and planned projects. This helps conceptualize where current activities are ongoing or planned in Amman and where there are gaps.

Table 4.5. Key Existing Plans and Projects in Amman

Title	Type	Timeframe	Description	Relation to GCAP
Amman Resilience Strategy	Plan	2016	Outlines a holistic set of actions to address the well-being of Amman's environment and its citizenry. The Amman Resilience Strategy	The underlying themes and several specific actions were carried forward into the development of the GCAP. Key goals outlined in the Resilience Strategy are promoting walkability, improving




Title	Type	Timeframe	Description	Relation to GCAP
			provides a vision of what Amman's citizens hope to see in the future.	mobility systems, institutionalizing planning, managing climate change commitments, improving waste and water resource management, improve energy efficiency and security, and applying green building codes.
Amman Bus Rapid Transit Network (BRT)	Project	2010 – 2020	BRT is nearing end of construction and will be active in 2020/2021. The new BRT has a bearing on future transport planning in Amman as it aims to shift citizens to public and low/no-emission transport.	The actions within the GCAP have been developed to complement and build on the BRT system. This includes actions that promote awareness of public transport and investments that will further integrate mobility systems.
Amman Climate Action Plan	Plan	2018 - 2019	Led by the World Bank, this plan outlines specific climate mitigation and adaptation measures GAM will take to meet its INDCs and improve its resilience.	Several of the actions were incorporated into the GCAP.
Draft National Green Growth Action Plan	Plan	2018 - ongoing	Ongoing Global Green Growth Institute (GGGI) initiative developing a national strategy for green growth. This project will identify green growth opportunities and Green Key Performance Indicators, design a cross-sector green growth policy framework and implementation roadmap, facilitate institutional and stakeholder engagement to provide a platform that will attract long-term financing, and facilitate knowledge-sharing activities in support of sector strategies.	The GCAP was developed to complement the proposed actions that will comprise the National Green Growth Action Plan, to ensure that municipal actions are in line with national goals.
GIZ Green Infrastructure Project	Project	2017 - 2022	This project aims to increase and enhance green infrastructure in Amman and employs vulnerable populations to develop these spaces.	Given that one of the PECs identified is Amman's low ratio of green space, the GCAP can build on this GIZ project and ensure that there is no redundancy in locations of functional green spaces proposed or implemented via GIZ or the GCAP.

5.Green City Actions for Amman

This Chapter details the actions that will support Amman's green future. Each action is set out in a table that includes the following:

- **Action title** – the name of the action and the action ID.
- **Strategic objectives** – the strategic objectives to which the action relates.
- **Priority environmental challenge and related pressures** – the PECs and related pressures this action addresses.
- **Description and rationale** – what the action proposes and explanation of its importance.
- **Steps for implementation** –outlines a broad set of steps that the action owner will take to take the action to implementation.
- **Type of action** – whether the action is a policy, plan/strategy, or a capital project.
Capital projects: infrastructure investments that GAM will undertake either using municipal funds or with support from external stakeholders.
Policy measures: new legislation or policy enacted to drive more environmentally-friendly activities.
Plans and strategies: more detailed roadmaps for improving performance in a specific sector or area (e.g. Waste Presentation and Recycling Strategy).
- **Plan for delivery** – identifies the
Action owners: the department within GAM that will take responsibility for action implementation and monitoring
Additional stakeholders:
Revenue or savings opportunities derived from the action: the cost savings or revenue opportunities that implementing that action will likely bring to the municipality or relevant stakeholders.
Action timeline: the period over which the action will be implemented.
- **Impact measures** – identifies the KPIs for each action that relate to the Monitoring and Evaluation plan set out in Chapter 6. These KPIs are generated from the Indicator Database that informed Amman's Green City Baseline.
- **Estimated cost** – the financial costs of capital expenditure (CapEx) and operational expenditure (OpEx) of actions, as well as other design and development costs (e.g. consultant fees). Actions may require CapEx and/or OpEx, or may not require investment at all. See Table 5.1 for the overview of the costs.

Table 5.1. Cost Summary for the Amman GCAP Actions

Total Number of Actions:		36
Total Estimated Costs:		€ 209,769,000 - € 268,710,500
<div> <div>  </div> <div> CapEx Costs Number of Actions: 21 Minimum Estimated Costs: € 206,560,000 Maximum Estimated Costs: € 264,590,000 </div> </div>		
<div> <div>  </div> <div> OpEx Costs Number of Actions: 3 Minimum Estimated Costs: € 168,000 Maximum Estimated Costs: € 230,000 </div> </div>		
<div> <div>  </div> <div> Design/Development Costs Number of Actions: 10 Minimum Estimated Costs: € 3,041,000 Maximum Estimated Costs: € 3,890,500 </div> </div>		

Note: the costs for actions EB4.1, EB4.2, and EB8 have been unable to be confirmed and are not included in the above estimates










- **Co-benefits** – sets out the carbon saving of applicable actions as well as a range of co-benefits. The full benefits assessment can be found in Appendix B. The co-benefits criteria are noted in Table 5.2. The actions are ranked from 0-3 for each co-benefit detailed in Table 5.2; from 0, which implies that the co-benefit is not realised from the action, to 3, which implies that the co-benefit is fully realised from this action.

Table 5.2. Co-benefits criteria

Social co-benefits	Economic co-benefits	Institutional co-benefits
<ul style="list-style-type: none"> • Improve health • Improve safety and/or security • Enhance the public realm • Access to basic services • Social equity 	<ul style="list-style-type: none"> • Revenue generating activities/net savings of costs • Promotes economic inclusion • Avoided damages 	<ul style="list-style-type: none"> • Improve institutional capacity or efficiency • Enhances the legislative environment

Each action described within this GCAP is valuable in its own right in order to achieve an increasingly sustainable Amman. To help with the implementation strategy however, GAM has highlighted the actions listed in **Table 5.2** below to prioritise in terms of funding and delivery. These actions are also highlighted throughout Chapter 5 with an orange border.

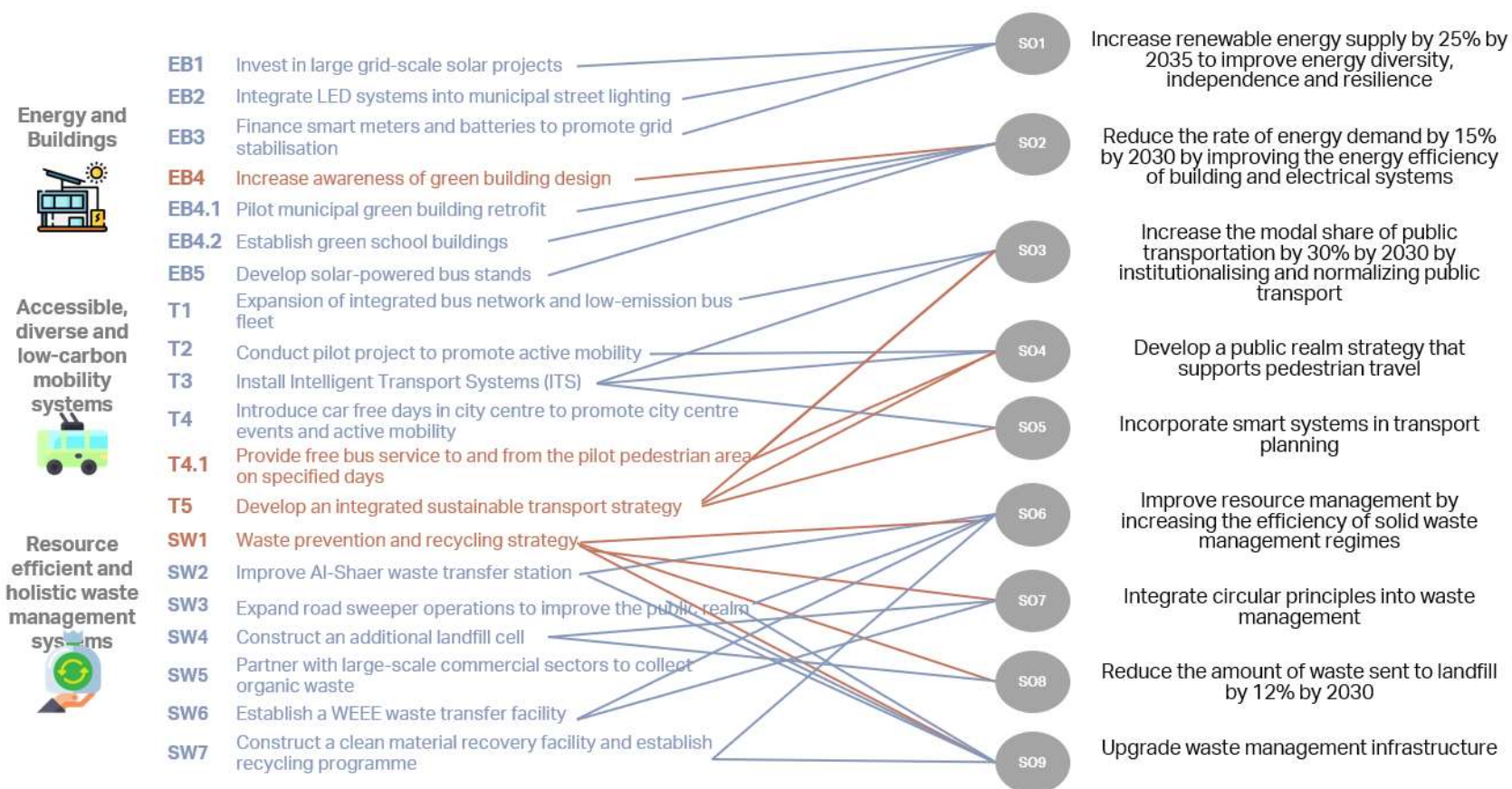
Table 5.3 Priority GCAP actions

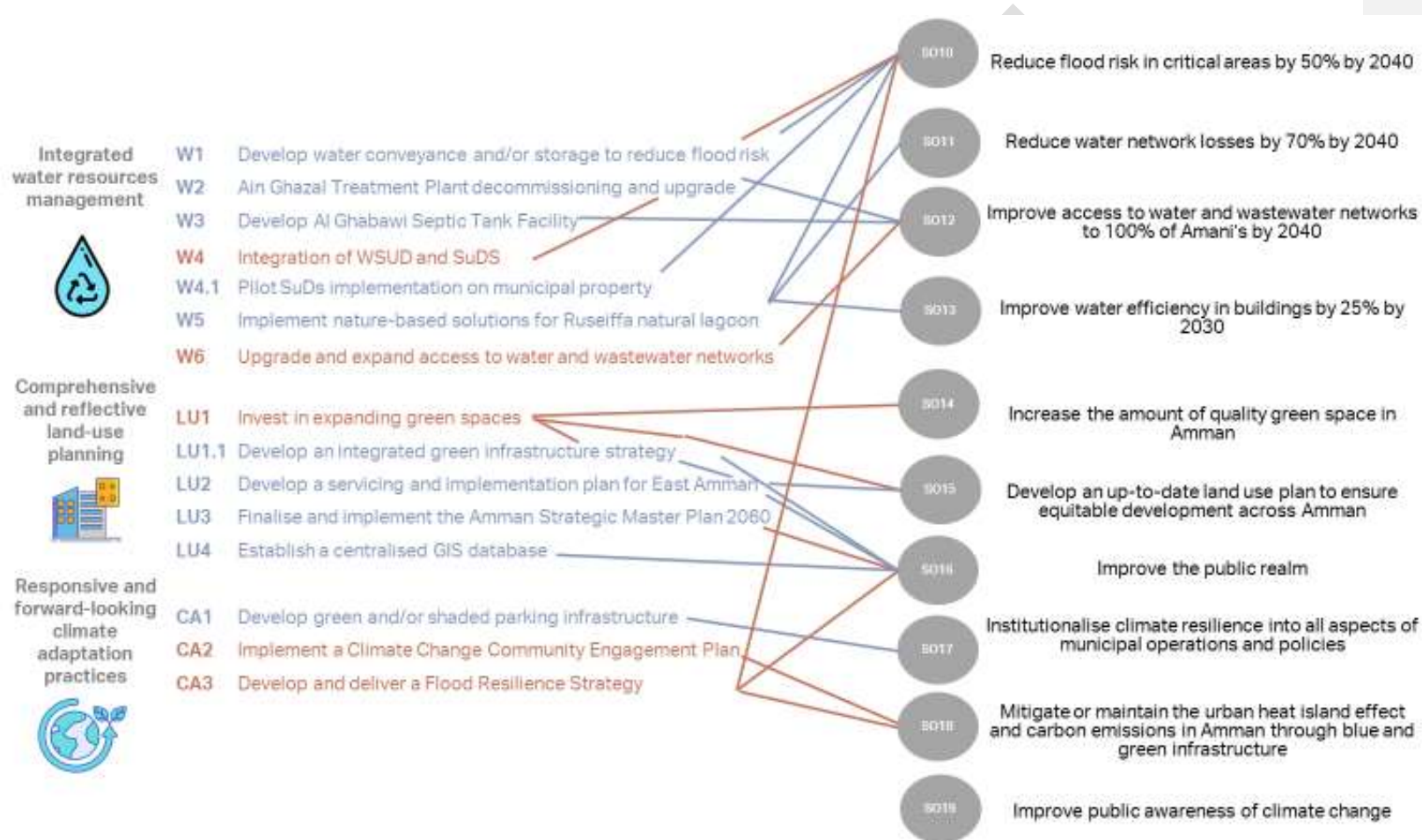
Sector	Action ID	Action Title
	EB2	Integrate LED systems into municipal street lighting
	T1	Expansion of integrated bus network and low-emission bus fleet
	SW2	Improve Al-Shaer waste transfer station
	SW4	Construct an additional landfill cell
	W1	Develop water conveyance and/or storage to reduce flood risk
	W2	Ain Ghazal Treatment Plant decommissioning and upgrade
	W3	Develop Al Ghabawi Septic Tank Facility
	LU1	Invest in expanding green spaces
	CA.1	Develop green and/or shaded parking infrastructure

There are many acronyms and labels used throughout this chapter, as such a summary of acronyms and their descriptions are provided below:

Acronym	Definition
SO	Strategic Objective
PEC	Priority Environmental Challenges
EB	Energy Systems and Buildings
T or TR	Transport
ES	Energy Supply
W or WC	Water Cycle
SW	Solid Waste Management
IN	Industrial
CA	Climate Change Adaptation
LU	Land Use
W	Water Cycle Management

Figure 5.1. Action hierarchy. Note that the blue colour denotes an action as an 'investment' and the orange colour denotes an action as an 'enabling' action.





5.1 Efficient and resilient energy systems and buildings

Energy systems and buildings are key components of sustainability. When energy systems rely on fossil fuel combustion, they are not resilient to shortages, import disruptions in fossil fuel supply and the combustion contributes to climate change and poor air quality. This is particularly relevant to Amman as Jordan relies on imports from neighbouring countries to supply the majority of its fuel, which decreases its energy security. Jordan is working to increase its energy diversity and reduce the carbon intensity of its energy systems, through both its Intended Nationally Determined Contributions pledge under the Paris Agreement, and through policies promoting renewable energy uptake, particularly solar. The GAM is also working to enhance the resilience and efficiency of both energy systems and buildings.

The GCAP will build on this existing work and contribute to a framework of resilient and efficient energy systems and building stock within Amman. The strategic objectives and supporting actions associated with this thematic area are detailed below:

Strategic objectives		Related pressure and environmental challenges	priority
SO1	Increase renewable energy supply by 25% by 2035 to improve energy diversity, independence and resilience	PEC1, Es1	
SO2	Reduce the rate of energy demand by 15% by 2030 by improving the energy efficiency of building and electrical systems	PEC1, Es2	

The proposed actions seek to **increase the diversity of energy supply** in Amman by promoting the uptake of solar PV on small and large scales, and by developing the necessary infrastructure to **support grid integration of renewable energy**. Additionally, the proposed actions aim to **decrease the energy intensity of infrastructure** by improving energy efficiency in both electrical networks and building stock.

Investment actions:

Action ID	Action title	Related SO	Total costs
EB1	Invest in large grid-scale solar projects	SO1	€ 26,000,000 – € 65,000,000
EB2	Integrate LED systems into municipal street lighting	SO1, SO2	€ 18,500,000
EB3	Finance smart meters and batteries to promote grid stabilisation	SO1, SO2	€ 22,000,000
EB4.1	Pilot municipal green building retrofit	SO2	No costing available
EB4.2	Establish green school buildings	SO2	No costing available
EB5	Develop solar-powered bus stands	SO2	€ 280,000 – € 780,000
EB6	Expand the existing Landfill Gas Recovery (LFG) System	SO1	No costing available

Enabling actions:

Action ID	Action title	Related SO	Total costs
EB4	Increase awareness of green building design	SO2	€ 90,000 – € 130,000

EB1: Invest in large grid-scale solar projects				
Strategic objective(s)	SO1: Increase renewable energy supply by 25% by 2035 to improve energy diversity, independence and resilience			
Priority environmental challenges	Priority environmental challenge		Priority environmental challenge	
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems		(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	
Description <i>What will be done?</i>	GAM will lead investment in the development of a large grid-scale solar farm with JEPco of between 20 and 50 MW. This will be dependent on a feasibility study to identify suitable locations, with potential options including the area around Queen Alia Airport or through public-private partnerships with existing landowners within municipal boundaries. GAM will also investigate the potential to utilise large battery systems (MWh-scale) in parallel to the provision of solar capacity, as this will enhance energy security and resilience for Amman.			
Rationale <i>Why is it being proposed?</i>	Diversified energy sources will help to ensure that Amman becomes more self-reliant. This will enhance energy security and resilience, while also increasing the stability of energy supplies and their associated costs. Additionally, this will contribute to Amman's emission reduction targets and improve its air quality.			
Steps for implementation	<ol style="list-style-type: none">1. Formalise the project team with members from Jordan Electric Power Company (JEPCo) and clarify the project lead (GAM/JEPCo).2. Project team will develop the scope of work and action plan to determine the scale of the intended project/s and focus areas (geographic).3. Draft detailed budgets and cash flow implementation plans for this (high CapEx) project. A Build-Order Transfer (BoT) or Purchase Power Agreement (PPA) model is envisaged, with details documented as the foundation for the tender scheme.4. Develop the Public-Private Partnerships (PPP) Project.5. Project team undertake tender process with TOR review and selection criteria.6. Support of the project team during execution by external experts, with the possibility of having an energy service company (ESCO) performance contract model to put responsibility on the suppliers/contractors.7. Post tender execution, monitor and evaluate project performance and where improvements are identified, implement actions accordingly.8. Ensure after sales care and maintenance to ensure project sustainability.			
Type of action	Capital project			
Plan for delivery	Action owner	GAM in partnership with JEPCo		
	Stakeholders	Solar suppliers, installers, developers		
	Financing options	PPP; municipal budget; international financial institutions, JREEEF for impoverished communities		
	Revenue/savings opportunities	Municipal solar assets have the ability to reduce costs over the long-term, through either revenue generation by feeding this into the larger grid and by reducing potential damages by increasing the security of supply.		
	Timeline	2021 - 2026		
Impact measures	State indicators: <ul style="list-style-type: none">• Concentration of PM2.5, PM10, SO2, NOx in air• Concentration of mercury, cadmium and zinc in soil• Annual CO2 emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none">• Proportion of total energy derived from renewable energy sources as a share of total city energy consumption• % of energy produced from renewable energy sources• Amount of crude oil and oil products, coal, natural gas, and pet coke used for energy generation• % of solar energy generation			
Estimated cost	CapEx: € 26,000,000 – € 65,000,000 OpEx: N/A Design/Development Costs: N/A			
Estimated co-benefits	Social co-benefits			
	Action will improve health	Action will improve health	Action will improve health	Action will improve health
	1	1	1	1
	Economic co-benefits			
	Revenue generating activities	Revenue generating activities	Revenue generating activities	
3	3	3		

	Institutional co-benefits	
	<i>Improve institutional capacity or efficiency</i>	<i>Improve institutional capacity or efficiency</i>
	0	0

EB2: Integrate LED systems into municipal street lighting				
Strategic objective(s)	SO1: Increase renewable energy supply by 25% by 2035 to improve energy diversity, independence and resilience SO2: Reduce the rate of energy demand by 15% by 2030 by improving the energy efficiency of building and electrical systems			
Challenges	Priority environmental challenge (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems		Related pressure (Es1) Fossil-fuel dominated energy supply (Es2) Energy and water performance of buildings	
Description What will be done?	The goal is to install, operate, maintain and manage an energy efficient street lighting solution in the city of Amman. This project will replace around 25,000 existing street lighting systems with new energy efficient LED lamps, in addition to a monitoring system and a street light control centre. The city has already replaced around 100,000 street lamps with LED systems. The expansion of this scheme will target residential streets, including streets with medium and high street poles. GAM will proceed with the project on a supply and installation basis, thus operating the new energy efficient fixtures on their own. This project is compatible with the GAM Led project.			
Rationale Why is it being proposed?	This work will contribute to carbon emissions reductions and increased energy efficiency through more efficient LED lighting systems.			
Steps for implementation	1. Formalise the project team and organise project kick-off dates based on established timelines. 2. Survey the main residential streets with data stock (number of light poles) and focus on streets with highest impact (highest population density streets).. 3. Engage and inform local residents of the project plans. 4. Set out clear project measurement and reporting KPIs, prior to tendering. 5. Chose the evaluation committee, identify clear criteria for section and initiate tender process. 6. Post tender execution, monitor and evaluate project performance and where improvements are identified, implement actions accordingly. 7. Conduct a lessons learnt stage once the first 10,000 units have been installed, to review the implementation of the project and to make any required changes or adjustments.			
Type of action	Capital project			
Plan for delivery	Action owner	GAM		
	Stakeholders	Residents of the streets in the chosen areas, Supplier		
	Financing options	Sub-sovereign lending to GAM by EBRD		
	Revenue/savings opportunities	Energy savings from lower energy consuming LEDs, energy savings from solar supply to replace grid supply		
	Timeline	2020 – 2024		
Impact measures	State indicators: <ul style="list-style-type: none">• Concentration of PM2.5, PM10, SO2, NOx in air• Concentration of mercury, cadmium, and zinc in soil• Annual CO2 emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none">• Proportion of total energy derived from renewable energy sources as a share of total city energy consumption• % of energy produced from renewable energy sources• Amount of crude oil and oil products, coal, natural gas, and pet coke used for energy generation			
Estimated cost	CapEx:	€ 18,500,000	OpEx:	N/A
Estimated co-benefits	Social co-benefits			
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services
	1	1	2	0
	Economic co-benefits			
	Revenue generating activities		Promotes economic inclusion	Avoided damages
	1		0	1
	Institutional co-benefits			
	Improve institutional capacity or efficiency		Enhances legislative environment	
	0		0	

EB3: Finance smart meters and batteries to promote grid stabilisation			
Strategic objective(s)	SO1: Increase renewable energy supply by 25% by 2035 to improve energy diversity, independence and resilience SO2: Reduce the rate of energy demand by 15% by 2030 by improving the energy efficiency of building and electrical systems		
Challenges	Priority environmental challenge (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	Related pressure (Es1) Fossil-fuel dominated energy supply (Es2) Energy and water performance of buildings	
Description What will be done?	<p>This project will involve the financing of smart meters and batteries. This work will be undertaken with the electricity distribution company serving Amman (and surrounding areas). JEPCo is a private electricity distribution company (disco) operating in Amman and central Jordan, the largest of the 3 discos and NEPCo's largest customer. They are overseen by the regulator Energy and Mineral Regulatory Commission (EMRC). JEPCo benefits from a Regulated Asset Base (RAB).</p> <p>The CapEx will finance the following investments:</p> <ol style="list-style-type: none">1. Smart meters: JEPCo launched an investment programme to deploy smart meters, with 70,000 installed and an expected 100,000 by year-end. They are now in discussion with the regulator to accelerate their smart meters programme to deploy 150,000 smart meters annually for the next 4 years.2. Storage: JEPCo is looking to invest in battery storage units to stabilise the network and increase its grid's capacity to absorb additional distributed PV systems. JEPCo plans to invest in small scale batteries with each battery holding approximately 10 MWh of storage capacity in around 30 main substations, of which 50% is in the GAM. <p>After successful implementation, the project will be scaled up, building on lessons learnt from the first phase.</p>		
Rationale Why is it being proposed?	This project will support grid stabilisation because it will store energy at peak times of generation or low demand, which will later be returned to the grid when demand is high. Smart meters automatically send meter readings to energy suppliers, providing accurate quantification of energy used rather than estimates, supporting users to better understand their consumption patterns.		
Steps for implementation	<ol style="list-style-type: none">1. Formalise the project team2. Complete the PPP Project Preparation Cycle3. Establish the project scale and budget and if financing, numerate the GAM role options4. Check the financing sources for the project with a developed concept note5. Post tender execution, monitor and evaluate project performance and where improvements are identified, implement actions accordingly.6. Project review after the implementation of Phase 1, to incorporate lessons learnt for the proceeding phases.		
Type of action	Capital project		
Plan for delivery	Action owner	JEPCo with support and facilitation from GAM (GAM will be as a strategic partner and supporter for the Energy and Minerals Regulatory Commission (EMRC) and electricity distribution companies, or by facilitating the provision of financial support from the funding agencies as GAM's partners.)	
	Stakeholders	GAM, suppliers	
	Financing options	EE action through JREEF fund with smart meters, Municipal Budgets; international financial institutions	
	Revenue/savings opportunities	Grid stabilisation may result in less transmission loss and greater energy security.	
	Timeline	2020-2023	
Impact measures	State indicators: <ul style="list-style-type: none">• Concentration of PM2.5, PM10, SO2, NOx in air• Concentration of mercury, cadmium, and zinc in soil• Annual CO2 emissions per capita and per unit of GDP		
	Pressure indicators: <ul style="list-style-type: none">• Per capita electricity consumption		
Estimated cost	CapEx: € 22,000,000	OpEx: N/A	Design/development costs: N/A
	Social co-benefits		

Estimated co-benefits	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	2	1	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	1		0	1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
	0			0	

EB4: Increase awareness of green building design					
Strategic objective(s)	SO2: Reduce the rate of energy demand by 15% by 2030 by improving the energy efficiency of building and electrical systems				
Challenges	Priority environmental challenge		Related pressure		
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity		(Es1) Fossil-fuel dominated energy supply		
	(PEC6) Management of intensifying drought and overheating risks		(Es2) Energy and water performance of buildings		
Description <i>What will be done?</i>	GAM will develop an awareness campaign around the benefits of green building design. Green building design promotes energy and water efficiency, and can also support climate resilience through measures that prioritise occupant comfort (e.g. mitigating risk of overheating). Jordan has a Green Building Guideline and Rating System (2011) which is compulsory and the Jordan Green Building Guidelines (2014) which are voluntary, but there is low awareness of these guidelines among engineers, companies, and residents.				
Rationale <i>Why is it being proposed?</i>	Green and sustainable buildings yield a range of benefits, including, low energy consumption (which leads to a lower generation of greenhouse gases), improved internal environments, and lower running costs.				
Steps for implementation	1. Formalise the project team. 2. Conduct extensive stakeholder mapping (both in the public and private sector). 3. Develop and implement an engagement strategy with KPIs, in partnership with Jordan Green Building Council. 4. Implement monitoring and evaluation to monitor KPIs and adjust campaign according to lessons learnt.				
Type of action	Plan/Strategy				
Plan for delivery	Action owner	GAM			
	Stakeholders	Ministry of Environment, Jordan Green Building Council, National Building Council,			
	Financing options	Donor agencies; UNFCCC adaptation fund, GEF Climate investment fund PPCR pilot program for climate resilience			
	Revenue/savings opportunities	Green buildings should result in a reduction in energy consumption, increased water efficiency meaning less water consumed, reduction in amount of refuse water meaning less energy consumption at the water treatment plants.			
	Timeline	2020 – 2023			
Impact measures	State indicators:				
	• Concentration of PM2.5, PM10, SO2, NOx in area				
	• Concentration of mercury, cadmium, and zinc in soil				
	• Annual CO2 emissions per capita and per unit of GDP				
	Pressure indicators:				
• Electricity consumption in buildings (residential and non-residential)					
• Proportion of total energy derived from renewable energy sources as a share of total city energy consumption					
• % of energy produced from renewable energy sources					
• Water consumption per capita					
Estimated cost	CapEx: N/A	OpEx: N/A	Design/Development Costs:	€ 90,000 – € 130,000	
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	0	1	1	0
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	1		1	1	
	Institutional co-benefits				

	<i>Improve institutional capacity or efficiency</i>	<i>Enhances legislative environment</i>
	1	0

FINAL DRAFT

EB4.1: Pilot municipal green building retrofit					
Strategic objective(s)	SO2: Reduce the rate of energy demand by 15% by 2030 by improving the energy efficiency of building and electrical systems				
Priority environmental challenges	Priority environmental challenge		Related pressure		
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC6) Management of intensifying drought and overheating risks		(Es1) Fossil-fuel dominated energy supply (Es2) Energy and water performance of buildings		
Description <i>What will be done?</i>	Building on the awareness campaign (EB4 "Increase awareness of green building design"), GAM will implement a pilot programme to retrofit municipal buildings to green standards in accordance with the Jordan Green Building Guide.				
Rationale <i>Why is it being proposed?</i>	This action aims to implement green building standards in municipal buildings as a means to illustrate the city's commitment to these standards. These standards will lower energy consumption in these buildings (which leads to a lower generation of greenhouse gases), improve occupancy health and comfort, and lower running costs. A pilot retrofit is planned for Al Hussein Cultural Center, with scope for further municipal building retrofits based on the results. This will include measures to enhance occupancy comfort during heatwaves.				
Steps for implementation	<ol style="list-style-type: none">1. Formalise the project team.2. Update the current status of green building adoption in Amman and set KPIs and targets.3. Scope the project to define the scale of implementation and timeline for green building stock.4. Develop a GAM green building tracker to enable monitoring of a sustainable green building adoption model for the city of Amman.5. Develop project implementation strategy and roll out city wide program, spearheaded by GAM buildings and other public institutions within GAM territory.6. Monitor and evaluate project performance to identify where improvements can be made and actioned accordingly.7. Plan the second project phase with new targets, as part of GCAP sustainable implementation plan.				
Type of action	Capital project				
Plan for delivery	Action owner	GAM			
	Stakeholders	Ministry of Environment, Jordan Green Building Council, National Building Council			
	Financing options	Donor agencies, UNFCCC adaptation fund, GEF Climate investment fund PPCR pilot program for climate resilience			
	Revenue/savings opportunities	Green buildings should result in a reduction in energy consumption, increased water efficiency meaning less water consumed, reduction in amount of refuse water meaning less energy consumption at the water treatment plants.			
	Timeline	2020 – 2023			
Impact measures	State indicators: <ul style="list-style-type: none">• Concentration of PM2.5, PM10, SO2, NOx in air• Concentration of mercury, cadmium, and zinc in soil• Annual CO2 emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none">• Electricity consumption in buildings (municipal)• Proportion of total energy derived from renewable energy sources as a share of total city energy consumption• % of energy produced from renewable energy sources• Water consumption in municipal buildings				
Estimated cost	Costing not available				
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	2	1	1	0
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	0		2	1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
0			0		

EB4.2: Establish green school buildings

Strategic objective(s)	SO2: Reduce the rate of energy demand by 15% by 2030 by improving the energy efficiency of building and electrical systems				
Challenges	Priority environmental challenge		Related pressure		
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity		(Es1) Fossil-fuel dominated energy supply (Es2) Energy and water performance of buildings		
Description <i>What will be done?</i>	The goal is to construct, retrofit and operate green school buildings with a low carbon footprint, as a way to make public buildings greener and harnessing the public and private sector's ability in maintaining and operating such green buildings through PPP structures. EBRD, along with IFC, are supporting the Ministry of Education (MoE) with the PPP preparation of a pilot project of 15 schools located in and around Amman. The MoE intends to replicate the model to support its programme of developing 600 schools across Jordan over the next 10 years.				
Rationale <i>Why is it being proposed?</i>	Building on the awareness campaign promoted in EB4 "Increase awareness of green building design" and similar to EB4.1 "Pilot municipal green building retrofit", this action aims to implement green building standards in schools. These standards can lower energy consumption in these buildings (which leads to a lower generation of greenhouse gases), improve occupancy health and comfort, and lower running costs.				
Steps for implementation	<ol style="list-style-type: none">1. Formalise the project team2. Complete the PPP Project Preparation Life Cycle3. Influence design of public school buildings. Implement innovative design forums with private and public sector, but also engaging school children through a design competition 'What is a Green School?'. 4. Incorporate green building elements in upcoming school PPP projects.5. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly				
Type of action	Capital project				
Plan for delivery	Action owner	Ministry of Education / Ministry of Public Works			
	Stakeholders	Green Building Council, PPP Unit			
	Financing options	Public-private partnership, if solar adaptation funds under UNFCCC can be applied for.			
	Revenue/savings opportunities	Energy savings from efficient building design			
	Timeline	2020 – 2024			
Impact measures	State indicators: <ul style="list-style-type: none">• Concentration of PM2.5, PM10, SO2, NOx in air• Concentration of mercury, cadmium, and zinc in soil• Annual CO₂ emissions per capita and per unit of GDP				
	Pressure indicators: <ul style="list-style-type: none">• Electricity consumption in buildings (residential and non-residential)• Proportion of total energy derived from renewable energy sources as a share of total city energy consumption• % of energy produced from renewable energy sources• Water consumption in schools				
Estimated cost	CapEx: TBC	OpEx: TBC		Design/Development Costs: TBC	
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	2	1	1	0
	Economic co-benefits				
	Revenue generating activities	Promotes economic inclusion		Avoided damages	
	0	2		1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency	Enhances legislative environment			
	0	0			

EB5: Develop solar-powered bus stands					
Strategic objective(s)	SO2: Reduce the rate of energy demand by 15% by 2030 by improving the energy efficiency of building and electrical systems				
Priority environmental challenges	Priority environmental challenge		Related pressure		
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems		(Es1) Fossil-fuel dominated energy supply (Es2) Energy and water performance of buildings		
Description <i>What will be done?</i>	GAM will install solar-powered bus stands incorporated into expanding BRT feeder system where grid connection is not feasible. Funds will be made available for electronic signage and some transport stop facilities (such as mobile charging facilities, localised street lighting and information boards) powered through solar located on the bus structures, with advertising space (e.g. on station walls or seating) being rented out to the private sector or used for GAM awareness campaigns.				
	The solar-powered information boards will provide real-time information to commuters regarding expected time of arrival of buses calling at the bus stand, the routes available from the bus stand, connecting bus routes, and guidance on how to reach user destinations. GAM has legal jurisdiction over the implementation of this action.				
Rationale <i>Why is it being proposed?</i>	The use of renewable energy at bus stands will reduce the amount of greenhouse gas emissions compared to powering the bus stands from the fossil fuel dominant grid. Improving the visibility, availability and awareness of public transportation through the installation of solar-powered information points at bus stands will help to increase the use of public transport in the city, which should help reduce the dependency on fossil fuel vehicles and lessen road congestion.				
Steps for implementation	1. Formalise the project team.				
	2. Define the number of bus stands, signage type, setup for soliciting adverts etc. This will include diagnosing poorly functioning or damaged existing bus stops and developing a new bus stop restructuring study.				
	3. Define bus stop specifications with BOQ for tender issuance.				
	4. Define signage specifications and meet with relevant advertising stakeholders to issue rental scheme or BOT basis for private sector delivery.				
	5. Budget the project based on scope and specifications for GAM approval and tender issuance.				
	6. Evaluate the tenders, with involvement of the project team.				
	7. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
	8. Retender second phase to ensure that the project can be scaled up and remains sustainable.				
Type of action	Capital Project				
Plan for delivery	Action owner	Directorate of Public Transportation			
	Stakeholders	GAM, Ministry of Energy, JEPCo			
	Financing options	Municipal budget; Private sector (revenues from advertising), BRT bus suppliers wishing to provide impactful CSR; potential PPP bundled with relevant BRT-related transport actions			
	Revenue/savings opportunities	Potential to shift behaviour towards increasing public transport use, which will consequently increase revenue for the municipality through increased ridership.			
	Timeline	2020 - 2024			
Impact measures	State indicators:				
	<ul style="list-style-type: none">Concentration of PM2.5, PM10, SO2, NOx in airConcentration of mercury, cadmium, and zinc in soilAnnual CO₂ emissions per capita and per unit of GDP				
	Pressure indicators:				
	<ul style="list-style-type: none">Proportion of total energy derived from renewable energy sources as a share of total city energy consumption% of energy produced from renewable energy sources				
Estimated cost	CapEx: € 280,000 – € 780,000	OpEx: N/A	Design/Development Costs: N/A		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	1	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	

	1	0	1		
	Institutional co-benefits				
	Improve institutional capacity or efficiency		Enhances legislative environment		
	0	0			
EB6: Expand the existing Landfill Gas Recovery (LFG) System					
Strategic objectives	SO1: Increase renewable energy supply by 25% by 2035 to improve energy diversity, independence and resilience				
Challenges	Priority environmental challenge	Related pressure			
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.	(Es1) Fossil-fuel dominated energy supply			
Description What will be done?	Cell number 5, which is currently operational at Al-Ghabawi landfill, is expected to reach full capacity by October 2022. GAM are currently operating an existing LFG system which includes Cells 1,2,3 and more recently ongoing construction works to further expand the LFG system to include Cell 4. By October 2022, when Cell 5 has reached its full capacity, the LFG system could be expanded to include Cell 5 as well. This will allow GAM to capture and use of landfill gas to generate electricity may also reduce the demand on the national electricity supply and reduces the amount of landfill gas emitted to the atmosphere.				
Rationale Why is it being proposed?	The capture and use of landfill gas to generate electricity may also reduce the demand on the national electricity supply and reduces the amount of landfill gas emitted to the atmosphere.				
Steps for implementation	1. Undertake a feasibility study to determine sizing, location and technical requirements for the LFG expansion 2. Determine preferred approach to funding and procurement. 3. Develop design, specifications and contracts for LFG expansion 4. Procure and supervise works. 5. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
Type of action	Capital project				
Plan for delivery	Action owner	Environmental and Solid Waste Directorate			
	Stakeholders	Energy companies (will need to have capacity to accept electricity generation from biogas)			
	Financing options	Municipal budget; donor agencies			
	Revenue/savings opportunities	Revenue generation from electricity generated from landfill gas combustion			
	Timeline	2022-2023			
Impact measures	State indicators: NA Pressure indicators: • % of MSW which is disposed of in open dumps, controlled dumps, bodies of water or is burnt				
Estimated costs	Costing not available				
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	1	3	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	3		1	3	
	Institutional co-benefits				
	Improve institutional capacity or efficiency		Enhances legislative environment		
	0		0		

5.2 Accessible, diverse and low-carbon mobility systems

Mobility is key to healthy, vibrant and inclusive urban space, providing access to jobs, services, recreation as well as family and friends. The current transport systems are, however, one of the main contributors to Amman's environmental challenges around air quality and greenhouse gas emissions. Private cars are the main mode of transport in the city, and congestion is common. This has led to poor air quality and associated respiratory illnesses for Amman's residents. The city has already begun to address this through the development of the Bus Rapid Transit (BRT) system and will strive to achieve the following strategic objectives for accessible, diverse and low-carbon transport systems:

Strategic objectives		Related pressure and priority environmental challenges
SO3	Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport	Pc1, Pc4, Pc5, Lu1, Tr1, Tr2, Tr3
SO4	Develop a public realm strategy that supports pedestrian travel	
SO5	Incorporate smart systems in transport planning	

The following actions seek to build upon this work by integrating multiple public and non-motorised transport options into Amman's network, including enhancing pedestrian infrastructure alongside green and public open spaces (discussed further in Chapter 5.6). Additionally, the actions aim to promote a **shift to public and active mobility** by providing further low-carbon transport options, through measures to **improve pedestrian safety and accessibility**. Finally, they strive to improve the degree to which Amman's different transport systems are accessible and integrated across the municipality.

Investment actions:

Action ID	Action title	Related SO	Total costs
T1	Expansion of integrated bus network and low-emission bus fleet	SO3	€40,000,000
T2	Conduct pilot project to promote active mobility	SO4	€ 5,900,000 – € 8,300,000
T3	Install Intelligent Transport Systems (ITS)	SO3, SO4, SO5	€3,300,000 – € 6,600,000
T4.1	Provide free bus service to and from the pilot pedestrian area on specified days	SO3, SO4	€ 200,000 – € 450,000

Enabling actions:

Action ID	Action title	Related SO	Total costs
T4	Introduce car free days in city centre to promote city centre events and active mobility	SO3, SO4	€ 70,000 – € 80,000
T5	Develop an Integrated Sustainable Urban Mobility Plan	SO3, SO4, SO5	€ 60,000 – € 120,000

T1: Expansion of integrated bus network and low-emission bus fleet					
Strategic objectives	SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport				
Challenges	Priority environmental challenge		Related pressure		
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems		(Tr1) Lack of public transport infrastructure (Tr3) Emissions from gasoline and diesel vehicles		
Description <i>What will be done?</i>	In order to increase the energy efficiency and reduce emissions from public transport, the city will purchase 150 new diesel and electric buses by the Greater Amman Municipality for public transport. The project will include the pilot study for electric buses, charging station infrastructure as well as diesel buses (Euro V and VI). We also have an upcoming feeder study, which will assess the new buses required in the city to serve as feeders between BRT stops and neighbourhoods. This project will be more useful for GAM if it builds on the projects already going ahead in GAM. .				
Rationale <i>Why is it being proposed?</i>	The aim of this action is to increase the use of public transport in Amman. Ultimately, this will aim to expand the electric-vehicle infrastructure and also promote the BRT. The increase in energy efficient public transport will have a multitude of environmental and Social co-benefits. On the environment side there will be less air pollution from diesel engines, less CO ₂ emissions, and reduced traffic if public transport becomes the preferred mode of transportation. Socially, the benefits will be in the increased access to transportation due to a larger fleet of busses and possibly greater connectivity due to an increase in bus stop locations as part of the ongoing BRT. GAM has full legal jurisdiction to implement this action.				
Steps for implementation	<ol style="list-style-type: none">1. Assess the outputs of the Feeder Study, when available.2. Assess the outcomes of the 150 Buses project and the pilot project for electric buses and associated charging infrastructure.3. Carry out feasibility studies for the routes identified in the Feeder Study, to determine which routes are most suitable for operation by electric buses and which are recommended to be operated by diesel buses: in terms of route length, slopes/grades, expected passenger demand, bus stop locations, bus frequency, connectivity with the new BRT system, etc. Include GAM and the Land Transport Regulatory Commission in the process.4. Identify costs, procurement procedures, operational needs, implementation logistics, and the operations business modality.5. Determine priority implementation of routes and the buses required for each route by recommended fuel type.6. Identify the type of procurement procedures and contracts7. Develop the tender documents, run the tender process and evaluation, leading to contract award.8. Purchase the buses and integrate them into planning, and make them operational				
Type of action	Capital Project				
Plan for delivery	Action owner	Public Transport and Infrastructure Transport Projects Directorate; Traffic Operation Department			
	Stakeholders	GAM, E-bus manufacturers/suppliers, Land Transport Regulatory Commission			
	Financing options	Municipal Budget; private sector operator			
	Revenue/savings opportunities	GAM can generate revenue from the operation of the municipal fleet			
	Timeline	2020 -2023			
Impact measures	State indicators: <ul style="list-style-type: none">• Concentration of PM2.5, PM10, SO2, NOx in air• Concentration of mercury, cadmium, mineral oil and zinc in soil• Annual CO₂ emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none">• % share of total public fleet that is hybrid or electric• Modal share of public transport• Number of cars per capita				
Estimated costs	CapEx: € 40,000,000	OpEx: N/A	Design/Development Costs: N/A		
Estimated co-benefits	Social co-benefits				
	Action will improve health		Improve safety and/or security		Enhance the public realm
					Access to basic services
					Social equity

	2	1	2	2	1
	Economic co-benefits				
	Revenue generating activities	Promotes economic inclusion			Avoided damages
	2	1			1
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
	0			0	

T2: Conduct pilot project to promote active mobility					
Strategic objective(s)	SO4: Develop public realm strategy that supports pedestrian travel				
Challenges	Priority environmental challenge		Related pressure		
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure		(Lu1) Competing land use priorities and pressures (Tr2) Poor pedestrian infrastructure		
Description <i>What will be done?</i>	The city will conduct a feasibility study and subsequently implement a pilot project to improve the connectivity of sidewalks along the catchment area of the BRT route, which is considered to be a 500m radius from BRT stops. GAM has full legal authority to undertake this project on municipal land, but will conduct the project in accordance with proposed and existing legislation. GAM will aim to incorporate green space where possible so long that it does not infringe on walkability and pedestrian safety.				
Rationale <i>Why is it being proposed?</i>	Amman has low walkability. With the BRT coming online shortly, improving the walkability of the sidewalks feeding into the BRT is crucial to ensure uptake and promote active mobility.				
Steps for implementation	<ol style="list-style-type: none">GAM to develop a set of policies and regulations to enforce improving the sidewalk condition in Amman, based on clear design guidelines and specifications.Develop a geospatial documentation system for the sidewalk condition in Amman, including sidewalk, sidewalk imperfections, geometric vertical and horizontal misalignments, drainage issues, etc.Identify areas under municipal ownership that can undergo retrofits for continuity along the BRT catchment area.Develop design drawings for typical sidewalk upgrades and renovation interventions.Implement pilots in the specified areas on a phased basis.Following pilots, identify streets where full pedestrianization would be suitable in the future to further promote active mobility.				
Type of action	Capital project				
Plan for delivery	Action owner	Public Transport and Infrastructure Transport Projects Directorate, Planning Directorate, Roads Directorate and Engineering Directorate			
	Stakeholders	GAM, Landowners, IFI's			
	Financing options	Municipal budget; donor agencies			
	Revenue/savings opportunities	N/A			
	Timeline	2021 -2025			
Impact measures	State Indicators: <ul style="list-style-type: none">Concentration of PM2.5, PM10, SO2, NOx in airConcentration of mercury, cadmium, mineral oil and zinc in soilAnnual CO₂ emissions per capita and per unit of GDP Pressure Indicators: NA				
Estimated cost	CapEx: € 5,900,000 – € 8,300,000		OpEx: N/A	Design/Development Costs: N/A	
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	2	1	0
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	3		0	1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency		Enhances legislative environment		
	0		0		

T3: Install Intelligent Transport Systems (ITS)					
Strategic objective(s)	SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport SO4: Develop a public realm strategy that supports pedestrian travel SO5: Incorporate smart systems in transport planning				
Challenges	Priority environmental challenge (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure		Related pressure (Tr2) Poor pedestrian infrastructure (Tr3) Emissions from gasoline and diesel vehicles		
Description <i>What will be done?</i>	The city will install ITS to improve traffic flows following the development of the Sustainable Urban Mobility Strategy (Action T5 "Develop an integrated sustainable transport strategy"). This will involve the use of technology to track the number of vehicles at intersections at different times of the day and the number of pedestrians crossing streets (including jaywalking). This would provide important information on pedestrian movements to advise on provision of pedestrian infrastructure and improvement of sidewalks to support Action T2. ITS are also used to provide real time information on traffic hot spots caused by traffic accidents and other road blockages and reroute vehicle traffic. The control centre could potentially be housed at Mahatta Terminal.				
Rationale <i>Why is it being proposed?</i>	The installation of an ITS will help to reduce traffic which will result in a reduction of GHG emissions and the rerouting of vehicle traffic during times of high pedestrian traffic will help to improve the experience of the city for pedestrians. Moreover, ITS will enhance data collection and inform future transport decision-making.				
Steps for implementation	<ol style="list-style-type: none">GAM to identify what ITS data is already being collected in the city by the traffic management center and public security department.GAM and relevant experts to prioritise the aspects of ITS that are most critical to Amman (e.g. traffic congestion, pedestrian movement, safety, parking, real-time public transport movement, etc) and ensure that these are communicated to national authorities to ensure proper integration.GAM to develop a mechanism, legislation and policies to add incentives into the use, generation and management of ITS data by different users and relevant agencies.GAM to create a new unit under the Transport Department to host and manage the ITS.GAM and transportation experts to prioritise the aspects of ITS that are important to Amman city, addressing main traffic domains (traffic congestion, pedestrian movement, safety, parking, real-time public transport movement, etc) to be processed by the ITS.Transportation and specialised information technology experts to identify the proper technology-related matters, including the framework architecture and the digital hardware elements for the mobility platform, with proper integration of geospatial analysis technologies.Procure the development of ITS system, starting with most critical areas.Launch the system and monitor its development and performance for a sufficient period of time.				
Type of action	Capital project				
Plan for delivery	Action owner	Public Transport and Infrastructure, Transport Projects Directorate, Traffic Operations Department, Land Transport Regulatory Commission			
	Stakeholders	GAM, Specialized IT Companies, ITS Experts, Traffic Management Center (GAM), Public Security Department			
	Financing options	Municipal budget			
	Revenue/savings opportunities	Improved efficiencies in transport and particularly improved data collection will improve GAM's decisions-making around transport in future.			
	Timeline	2021 - 2025+			
Impact measures	State indicators: <ul style="list-style-type: none">Concentration of PM2.5, PM10, SO2, NOx in airConcentration of mercury, cadmium, mineral oil and zinc in soilAnnual CO2 emissions per capita and per unit of GDP Pressure indicators: SNA				
Estimated costs	CapEx: € 3,300,000 – € 6,600,000		OpEx: N/A		Design/Development Costs: N/A
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity

	1	1	1	1	1
	Economic co-benefits				
	Revenue generating activities	Promotes economic inclusion		Avoided damages	
	0	0		1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency		Enhances legislative environment		
	1		0		

T4: Introduce car free days in city centre to promote city centre events and active mobility					
Strategic objective(s)	SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport SO4: Develop a public realm strategy that supports pedestrian travel				
Challenges	Priority environmental challenge (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure		Related pressure (Tr2) Poor pedestrian infrastructure (Tr3) Emissions from gasoline and diesel vehicles		
Description <i>What will be done?</i>	GAM will establish a pilot programme to trial car-free periods in the city centre, for holidays and special events. These will be based on lessons learnt from the successful implementation of Al-Wakalat St pedestrian friendly infrastructure and car-free events. Starting with holidays and limited hours on weekends, GAM will restrict general access to residents and deliveries during defined hours.. Implementation will require investment in enforcement mechanisms such as bollards and new signage. Car-free days will allow for more public events in the city centre (encouraging biking, walking, physical activity, street markets etc.) and will encourage an increasing pedestrian culture. The hours chosen will support a variety of different events and activities. This will be tied to the Amman Heritage Trail. This action will expand into a pilot trail in Jabal Amman.				
Rationale <i>Why is it being proposed?</i>	Creating more space for pedestrians and cyclists will help to improve the liveability of the city. Car-free areas also help to encourage more community interactions, exercise, and less air pollution, among other benefits.				
Steps for implementation	1. Select the project area based on a methodical urban planning approach and a well-examined commercial value proposition. Plan for future expansions of the project, considering connecting corridors. 2. Consult with relevant stakeholders, mainly the residents, landlords, and commercial entities. 3. Plan and redevelop the project area based on Action T2 "Conduct pilot project to promote active mobility", and Action T4.1 "Provide free bus service to and from the pilot pedestrian area on specified days". 4. Provide sufficient car parking infrastructure for the project area. 5. Coincide the first car free day with a launch event in the city, to increase public awareness and promote the initiative. 6. Conduct a regular assessment to ensure stakeholders' satisfaction and resolve any complications at the early stage of the project implementation phase.				
Type of action	Plan/Strategy				
Plan for delivery	Action owner	Public Transport and Infrastructure, Transport Projects Directorate and Traffic Operations Department.			
	Stakeholders	GAM, residents, landlords			
	Financing options	Municipal budget			
	Revenue/savings opportunities	Dependent on the type of activities, the city has the ability to generate revenue			
	Timeline	2020 – 2023			
Impact measures	State Indicators: <ul style="list-style-type: none">Concentration of PM2.5, PM10, SO2, NOx in airConcentration of mercury, cadmium, mineral oil and zinc in soilAnnual CO2 emissions per capita and per unit of GDP Pressure Indicators <ul style="list-style-type: none">Transport modal share in total trips (pedestrian transport)% road dedicated exclusively for pedestrian use				
Estimated costs	CapEx: € 70,000 – € 80,000		OpEx: N/A		Design/Development Costs: N/A
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	1	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	

	0	0	1
	Institutional co-benefits		
	Improve institutional capacity or efficiency	Enhances legislative environment	
	1	0	

T4.1: Provide free bus service to and from the pilot pedestrian area on specified days					
Strategic objective(s)		SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport SO4: Develop a public realm strategy that supports pedestrian travel			
Challenges	Priority environmental challenge		Related pressure		
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure		(Tr2) Poor pedestrian infrastructure (Tr3) Emissions from gasoline and diesel vehicles		
Description <i>What will be done?</i>		In order to increase awareness and participation in pedestrianised days, GAM will pilot a free bus service to take people to and from the area. The route will be defined based on the location of the pedestrian pilot. This will involve GAM purchasing an electric bus that can be incorporated into the BRT system, but will be taken out of BRT operation a few times a year to provide free transport to special events that will take place in the pedestrianised area. If the bus specifications are not suitable for use on the BRT infrastructure, the bus will instead be incorporated into the feeder routes.			
Rationale <i>Why is it being proposed?</i>		Increasing free bus services within Amman will help lower-income individuals to travel to their destinations and will also reduce traffic flows on major streets. This action has beneficial social and environmental outcomes. The secondary purpose of this pilot action is to promote electric buses and also awareness around public transportation. In the future this will result in, for example, a free bus service to culturally important sites, which could increase the number of tourists visiting those sites.			
Steps for implementation		1. GAM will validate the feasibility of the project considering policies, regulations, service strategies, routes, locations, budget, and expenses required for the free bus service. The route should include selection of stops with pedestrian access and suitable parking. 2. Identify the project requirements in terms of budget and infrastructure. 3. Conduct a procurement process to procure/source buses that meet the required specifications (preferably buses that meet BRT infrastructure requirements). 4. Launch an effective public awareness campaign around the pedestrianization project and accessibility of free bus service to encourage citizens to use the free bus services. 5. Consider leveraging the benefits of this action through proper planning and implementation of Action T3 "Install Intelligent Transport Systems (ITS)". This will improve mobility in Amman by reducing traffic congestion and reduce OpEx through deploying the bus fleet based on real-time demand.			
Type of action		Plan/Strategy			
Plan for delivery	Action owner	Public Transport and Infrastructure Transport Projects Directorate; Traffic Operations Department			
	Stakeholders	GAM, = transportation and ITS experts			
	Financing options	Municipal budget			
	Timeline	2020 – 2025			
Impact measures		State indicators: <ul style="list-style-type: none">Concentration of PM2.5, PM10, SO2, NOx in airConcentration of mercury, cadmium, mineral oil and zinc in soilAnnual CO2 emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none">Transport modal share in total trips [pedestrian and public transport]% road dedicated exclusively for pedestrian use			
Estimated costs		CapEx: € 200,000 – € 450,000	OpEx: N/A	Design/Development Costs: N/A	
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	2	1	2	2	2
	Economic co-benefits				
	Revenue generating activities	Promotes economic inclusion		Avoided damages	
1	0		0		

	Institutional co-benefits	
	<i>Improve institutional capacity or efficiency</i>	<i>Enhances legislative environment</i>
	0	0
	CO ₂ Savings	7% emissions savings if bus fleet is hybrid/ electric as opposed to existing buses fleet

T5: Develop an integrated sustainable urban transport strategy			
Strategic objective(s)	SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport		
	SO4: Develop public realm strategy that supports pedestrian travel		
	SO5: Incorporate smart systems in transport planning		
Challenges	Priority environmental challenge	Related pressure	
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure	(Tr2) Poor pedestrian infrastructure (Tr3) Emissions from gasoline and diesel vehicles	
Description <i>What will be done?</i>	The BRT is an important step in improving the efficiency of public transport in Amman. GAM will build on the BRT and develop an integrated sustainable urban transport strategy to address persistent barriers that Amani’s face to diverse transport options, including the lack of capacity in cross-departmental collaboration within the municipality. This plan will consider pedestrian and non-motorised transport schemes, public transport options, and institutional barriers, while also building on the BRT to reduce dependency on private vehicles. . Additionally, this plan will include a data collection and management component to support the development of Intelligent Transport Systems (ITS). This work should help to manage the rapid urban expansion being experienced in Amman. Of note, this action will seek to foster a public realm strategy that promotes accessibility, inclusivity, pedestrian safety, and social interaction. The Sustainable urban Transport Strategy will also incorporate amendments to Amman’s current Street Design Guidelines, and will aim to will integrate best practice examples from around the world tailored to Amman’s context meet the following principles: <div><div>1) Design and manage the street for a sense of place as well as movement.</div><div>2) Design the street to enhance its sense of place relating to Amman’s broader built and cultural heritage.</div><div>3) Encourage wellbeing through healthy, active lifestyles.</div><div>4) Design and manage the highway to make unsafe actions less likely.</div><div>5) Aim for total street design rather than uncoordinated components.</div></div>		
Rationale <i>Why is it being proposed?</i>	A sustainable urban mobility strategy is critical to ensuring that the public transportation systems within Amman are able to serve the increasing number of civilians.		
Steps for implementation	<div><div>1. GAM will use data from the ITS, as per Action T3 "Install Intelligent Transport Systems", to identify the commuter patterns from, to and within Amman.</div><div>2. Identify the functional urban areas that will be part of the Sustainable Urban Mobility Plan.</div><div>3. Develop a stakeholder engagement plan to ensure a participatory planning process.</div><div>4. Assess current and future performance in the functional urban area.</div><div>5. Define a long-term vision and a clear implementation plan.</div><div>6. Develop all transport modes in an integrated manner.</div><div>7. Arrange for monitoring and evaluation.</div><div>8. Assure quality and validation is in compliance with the requirements of SUMP practice.</div><div>9. Ensure incorporation of all public transport service information in online web application</div></div>		
Type of action	Plan/strategy		
Plan for delivery	Action owner	Public Transport and Infrastructure Transport Projects Directorate; Traffic Operations Department; Directorate of Planning	
	Stakeholders	GAM, BRT operator	
	Financing options	Donor agencies	
	Revenue/savings opportunities	Reduced costs associated with traffic congestion, greater revenue from public transport options	
	Timeline	2020 – 2024	
Impact measures	State Indicators: <ul style="list-style-type: none">• Concentration of PM2.5, PM10, SO2, NOx in air• Concentration of mercury, cadmium, mineral oil and zinc in soil• Annual CO2 emissions per capita and per unit of GDP Pressure Indicators: NA		
Estimated cost	CapEx: N/A	OpEx: N/A	Design/Development Costs: € 60,000 – € 120,000
	Social co-benefits		

Estimated co-benefits	<i>Action will improve health</i>	<i>Improve safety and/or security</i>	<i>Enhance the public realm</i>	<i>Access to basic services</i>	<i>Social equity</i>
	1	1	0	1	0
	Economic co-benefits				
	<i>Revenue generating activities</i>		<i>Promotes economic inclusion</i>	<i>Avoided damages</i>	
	1	1		1	
	Institutional co-benefits				
	<i>Improve institutional capacity or efficiency</i>		<i>Enhances legislative environment</i>		
	1		2		

5.3 Resource efficient and holistic waste management systems

Urban waste management systems are an essential service that contribute to both human and environmental health. Additionally, effective waste management is essential for supporting resource efficiency through waste reduction strategies, recycling and organic waste streams.

Waste generation in Amman has increased corresponding to the city's population growth, placing greater pressure on the city's existing waste infrastructure. The city has been taking steps to mitigate this, including expanding Al Ghabawi landfill. The outlined actions will contribute to GAM reaching its proposed strategic objectives to more efficiently manage and reduce its waste. Moreover, proposed actions also support Amman's energy objectives by harnessing the energy derived from organic and non-organic material.

Strategic objectives		Related pressure and priority environmental challenges
SO6	Improve resource management by increasing the efficiency of solid waste management regimes	Sw1, Es1
SO7	Integrate circular principles into waste management	
SO8	Reduce the amount of waste sent to landfill by 12% by 2030	
SO9	Upgrade waste management infrastructure	

The following actions will contribute to GAM reaching these objectives through measures that **improve the existing waste management infrastructure** and others that will **more efficiently manage existing waste streams** to enhance recycling and recovery of materials. Moreover, proposed actions also **support Amman's energy objectives** by harnessing the energy derived from organic and non-organic material.

Enabling actions:

Action ID	Action title	Related SO	Total costs
SW1	Waste prevention and recycling strategy	SO6, SO7, SO8, SO9	€ 40,000 – € 90,000

Investment actions

Action ID	Action title	Related SO	Total costs
SW2	Improve Al-Shaer waste transfer station	SO6, SO9	€ 6,500,000
SW3	Expand road sweeper operations to improve the public realm	SO6, SO9	€ 6,200,000
SW4	Construct an additional landfill cell	SO9	€ 7,800,000
SW5	Partner with large-scale commercial sectors to collect organic waste	SO7, SO8	€ 838,000 – € 1,260,000
SW6	Establish a WEEE waste transfer facility	SO7, SO6	€ 400,000 – € 410,000
SW7	Construct a clean material recovery facility and establish recycling programme	SO6, SO9	€ 7,000,000 – € 12,500,000

SW1: Waste prevention and recycling strategy					
Strategic objective(s)	SO6: Improve resource management by increasing efficiency of solid waste management regimes SO7: Integrate circular principles into waste management SO8: Reduce the amount of waste sent to landfill by 12% by 2030 SO9: Upgrade waste management infrastructure				
Challenges	Priority environmental challenge		Related pressure		
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.		(Sw1) Solid waste disposal practices (In1) Industrial solid waste disposal practices.		
Description What will be done?	GAM will develop a waste prevention and recycling strategy which will lay out a vision for how Amman will manage its waste until 2040. This strategy will target the following: <ul style="list-style-type: none">Reduction at source and sustainable consumptionAvoided and/or diverted waste flowsWaste minimisation This strategy will cover extraction, manufacturing, transport, distribution purchase and use, and produce re-use which form the basis of waste prevention. For the waste management component, the strategy will cover collection by local authorities or operators, preparation for material reuse, recycling, and other methods of pre-treatment, treatment, and recovery. It will also incorporate Extender Producer Responsibility legislation on a national scale. This will include a vision for incorporating objectives from the waste hierarchy, and development of facilities and behaviour change strategies to integrate recycling and circular principles into its waste streams. This strategy will serve as an umbrella action for further GCAP actions in the waste sector.				
Rationale Why is it being proposed?	Amman does not yet have a comprehensive waste strategy. Given the continued population growth, waste is expected to increase in the coming years. Thus, a strategy focusing first on waste prevention and then on recycling and reuse is key to managing the expected increase.				
Steps for implementation	2. Assign project manager and budget. 3. Tender the project to an external provider if required. 4. Develop a stakeholder engagement plan to ensure participatory planning. 5. Develop strategy using best practice. 6. Develop objectives and set up KPIs and relevant actions to ensure objectives are met. 7. Develop a monitoring and evaluation plan alongside the strategy so progress against each objective can be assessed and monitored and areas for improvements can be identified and implemented accordingly.				
Type of action	Plan/Strategy				
Plan for delivery	Action owner	Environmental and Solid Waste Directorate			
	Stakeholders	Waste suppliers, GAM, SMEs and large businesses			
	Financing options	Municipal budget; donor agencies			
	Revenue/savings opportunities	Optimally, a decrease in street maintenance/upkeep			
	Timeline	2021 - 2023			
Impact measures	State indicators: NA Pressure indicators: <ul style="list-style-type: none">Total solid waste generationShare of population with weekly municipal solid waste MSW collection% of MSW which is sorted and recycled				
Estimated costs	CapEx: N/A		OpEx: N/A		Design/development costs: € 40,000 – € 90,000
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	0	2	2	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion		Avoided damages
0		2		0	

	Institutional co-benefits	
	<i>Improve institutional capacity or efficiency</i>	<i>Enhances legislative environment</i>
	2	2

SW2: Improve Al-Shaer waste transfer station					
Strategic Objectives	SO6: Improve resource management by increasing the efficiency of solid waste management regimes SO9: Upgrade waste management infrastructure				
Challenges	Priority environmental challenge			Related pressure	
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.			(Sw1) Solid waste disposal practices (In1) Industrial solid waste disposal	
Description What will be done?	GAM will upgrade and expand the Al-Shaer waste transfer station, including its road networks to improve the coordination of vehicles on-site.				
Rationale Why is it being proposed?	The upgrade of waste transfer stations will improve the operational efficiency of the waste management system, allowing for better utilisation of waste collection vehicles and reducing traffic movements and their associated environmental impacts.				
Steps for Implementation	1. Undertake scoping and prefeasibility assessment to scope out project and assess suitability for bundled PPP (with SW4 "Construct an additional landfill cell" and/or SW5 "Partner with large-scale commercial sectors to collect organic waste" and/or SW6 "Establish a WEEE waste transfer facility" and/or SW7 "Construct a clean material recovery facility and establish recycling programme"). 2. Complete PPP Project Preparation Cycle. 3. Undertake a condition survey to determine baseline conditions of the existing transfer stations. 4. Prepare a Feasibility Study to determine technical requirements for upgrading the transfer stations (including throughputs, logistics and equipment needs) and develop outline cost estimates. 5. Determine preferred approach to funding and procurement. 6. Develop designs, specifications and contracts for upgrading works. 7. Procure and supervise works. 8. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
Type of action	Capital project				
Plan for delivery	Action owner	Environment and Solid Waste Directorate			
	Stakeholders	Street cleaning/collection contractors; transfer station operators			
	Financing options	Municipal budget; donor agencies; PPP			
	Revenue/savings opportunities	Potential for reduced vehicle fuel costs and less depreciation of refuse collection vehicles.			
	Timeline	2021 - 2022			
Impact measures	State indicators: • Concentration of PM2.5, PM10, SO2, NOx in air in immediate vicinity				
	Pressure indicators: • Total solid waste generation				
Estimated costs	CapEx: € 6,500,000	OpEx: N/A	Design/Development Costs: N/A		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	1	2	0
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion		Avoided damages
	1		2		0
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
	1			0	

SW3: Expand road sweeper operations to improve the public realm					
Strategic objectives	SO6: Improve resource management by increasing efficiency of solid waste management regimes SO9: Upgrade waste management infrastructure				
Challenges	Priority environmental challenge			Related pressure	
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.			(Sw1) Solid waste disposal practices (In1) Industrial solid waste disposal	
Description <i>What will be done?</i>	In order to improve solid waste management systems, GAM will purchase upwards of 25 vacuum road sweepers to supplement its existing system and develop a regular operation system in order to improve the urban realm.				
Rationale <i>Why is it being proposed?</i>	Additional road sweepers will help to ensure less solid waste pollution on city streets.				
Steps for implementation	1. Determine approach to funding and procurement. 2. Ensure personnel are provided with appropriate training 3. Develop route, number of sweepers and schedule design specifications for the regular road sweeper system. 4. Implement the regular road sweeper system. 5. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
Type of action	Capital project				
Plan for delivery	Action owner	Waste Operations Department			
	Stakeholders	Street cleansing/collection contractors			
	Financing options	Municipal budget; donor agencies			
	Revenue/savings opportunities	None			
	Timeline	2020			
Impact measures	State indicators: NA Pressure indicators: • Total solid waste generation				
Estimated costs	CapEx: € 6,200,000	OpEx: N/A	Design/Development Costs: N/A		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	0	2	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	0		2	1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
	0			0	

SW4: Construct an additional landfill cell					
Strategic objectives	SO9: Upgrade waste management infrastructure				
Challenges	Priority environmental challenge		Related pressure		
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.		(Sw1) Solid waste disposal practices (In1) Industrial solid waste disposal (Es1) Fossil-fuel dominated energy supply		
Description <i>What will be done?</i>	Presently, Al Ghabawi landfill has 16 years of remaining capacity. To increase its capacity, GAM will build an additional landfill cell (cell number 6). The development of a new cell includes the capping of cell 5 and developing the necessary infrastructure for landfill gas capture and utilisation. Solar PV installation on capped cell 5 can be considered pending further feasibility studies. This includes the construction of additional biogas engines to process organic waste (SW5 "Partner with large-scale commercial sectors to collect organic waste"). This action will work in combination with GAM's waste prevention and recycling strategy (SW1 "Waste prevention and recycling strategy") to extend the capacity of the existing landfill, while SW1 will work to reduce Amman's waste generation overall.				
Rationale <i>Why is it being proposed?</i>	An additional landfill cell at Al-Ghabawi will ensure proper waste disposal and allow greater capacity to meet the demands of Amman's growing population, with solid waste generation increasing by approximately 16% from 2014 to 2019 . The capture and use of landfill gas to generate electricity may also reduce the demand on the national electricity supply and reduces the amount of landfill gas emitted to the atmosphere.				
Steps for implementation	6. Undertake a feasibility study to determine sizing, location and technical requirements for the new cell 7. Determine preferred approach to funding and procurement. 8. Develop design, specifications and contracts for landfill construction and operation 9. Procure and supervise works. 10. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
Type of action	Capital project				
Plan for delivery	Action owner	Environmental and Solid Waste Directorate			
	Stakeholders	Waste contractors Energy companies (will need to have capacity to accept electricity generation from biogas)			
	Financing options	Municipal budget; donor agencies			
	Revenue/savings opportunities	Revenue generation from electricity generated from landfill gas combustion			
	Timeline	2021 – 2022			
Impact measures	State indicators: NA Pressure indicators: • % of MSW which is disposed of in open dumps, controlled dumps, bodies of water or is burnt				
Estimated costs	CapEx: € 7,800,000	OpEx: N/A	Design/Development Costs: N/A		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	0	1	1	2	0
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	2		2	1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency		Enhances legislative environment		
0		0			

SW5: Partner with large-scale commercial sectors to collect organic waste		
Strategic objective(s)	SO7: Integrate circular principles into waste management SO8: Reduce the amount of waste sent to landfill by 12% by 2030	
Challenges	Priority environmental challenge	Related pressure
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.	(Sw1) Solid waste disposal practices (In1) Industrial solid waste disposal (Es1) Fossil-fuel dominated energy supply
Description <i>What will be done?</i>	As part of the Climate Action Plan the city can implement organic waste collection. KfW is currently undertaking a small-scale pilot project on the collection of organic waste from commercial operators. This will be expanded and modified for large-scale commercial operations (e.g. for hotels, restaurants, markets, food processing industry, etc.), whereby the municipality partners with these operators to facilitate collection and transfer of organic waste to the landfill and corresponding biogas engines (detailed in SW4 "Construct an additional landfill cell").	
Rationale <i>Why is it being proposed?</i>	Separate collection and treatment of organic waste can: <ol style="list-style-type: none"> Reduce the amount of landfill void space and the generation of landfill gas; Produce low-carbon energy by anaerobic digestion and combustion of the resulting biogas; Produce a soil improver which can be beneficially reused in agriculture. 	
Steps for implementation	<ol style="list-style-type: none"> Under prefeasibility study to scope the project, assess impact on fiscal budget and lessons learnt from KfW pilot. Complete PPP Project Preparation Cycle if applicable based on lessons learnt from KfW pilot. Identify major organic waste producers and carry out stakeholder engagement to determine willingness to participate in an organic waste collection scheme and likely quantities that can be collected. Carry out feasibility study to determine sizing, location and technical requirements for organic waste treatment facilities (whether anaerobic digestion or composting) and their potential integration with landfill gas utilisation, policy and regulatory requirements, targets and incentives (including voluntary CSR programs), collection systems and cost estimates for both collection and treatment, using information from the KfW pilot project. Determine preferred approach to funding and procurement. Develop designs, specifications and contracts for agreed technology. Procure and supervise works. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly. 	
Type of action	Capital project	
Plan for delivery	Action owner	Environmental and Solid Waste Directorate
	Stakeholders	<ul style="list-style-type: none"> Waste contractors Major organic waste producers (food industry, major hotel/restaurant chains) Agricultural sector (end users of compost/soil improver) Energy companies (will need to have capacity to accept electricity generation from biogas) GAM
	Financing options	Municipal budget; international financial institutions
	Revenue/savings opportunities	Potential revenue from electricity sales, but overall cost of waste management may increase compared to current landfill arrangements.
	Timeline	2020 - 2023
Impact measures	State indicators: <ul style="list-style-type: none"> Annual CO₂ emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none"> Percentage of collected MSW composted 	
Estimated costs	CapEx: € 800,000 – € 1,200,000 OpEx: € 38,000 – € 60,000 Design/Development Costs: N/A Total Cost: €838,000 - €1,260,000	

SW6: Establish WEEE waste collection facility					
Strategic objective(s)	SO6: Improve resource management by increasing efficiency of solid waste management regimes SO7: Integrate circular principles into waste management				
Challenges	Priority environmental challenge			Related pressure	
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.			(Sw1) Solid waste disposal practices (In1) Industrial solid waste disposal	
Description <i>What will be done?</i>	A priority in the waste sector is the treatment of waste electrical and electronic equipment (WEEE). There is currently no area for residential and commercial WEEE (e.g. laptops, refrigerators, etc.). GAM will invest in development of an area dedicated solely for high-value WEEE, where this waste can be collected and temporarily stored pending off-site refurbishment or recycling by third-parties. This action will require engagement with third parties who are willing and able to receive and refurbish or recycle WEEE in accordance with good international industry practice.				
Rationale <i>Why is it being proposed?</i>	Improved WEEE processing contributes to a more vibrant circular economy. This will provide increased economic opportunities in terms of repair, reuse and reprocessing, retaining economic value within the city. Extending product life cycles overall will reduce consumption, thereby reducing the environmental footprint of materials.				
Steps for implementation	8. Undertake prefeasibility study to scope the project and assess impact on fiscal budget. 9. Complete PPP Project Preparation Cycle. 10. Undertake stakeholder engagement to identify main sources of WEEE and the current scope of the informal WEEE recycling sector. 11. Carry out a feasibility study to determine technical solutions to reuse/recycling and the existing capacity of operators in the country/region, existing or planned Extended Producer Responsibility (EPR) schemes, markets for recycled or refurbished products, suitable locations (including co-location at existing waste collection facilities) and likely capital and operating costs. 12. Identify preferred financing and procurement route, including how these might be linked to existing or planned EPR schemes. 13. Develop designs, specifications and contracts for construction and operation. 14. Procure and supervise works. 15. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
Type of action	Capital project				
Plan for delivery	Action owner	Environment and Solid Waste Directorate			
	Stakeholders	<ul style="list-style-type: none">Electrical retailers (including repairers)Waste contractorsTrading standards/safety department (for ensuring safety of refurbished articles)Commodity importers/exporters (for recovered plastics/metals)Hazardous waste management contractors (for management of hazardous residual materials)Informal recycling and refurbishment operators			
	Financing options	Municipal budget; PPP			
	Revenue/savings opportunities	Potential revenue from sale of recycled materials and refurbished equipment, but dependent on global commodity prices which can fluctuate considerably.			
	Timeline	2021 - 2025			
Impact measures	State indicators: <ul style="list-style-type: none">Concentration of mercury, cadmium, mineral oil and zinc in soil Pressure indicators; <ul style="list-style-type: none">% of MSW which is sorted and recycled				
Estimated cost	CapEx: € 400,000 – € 410,000	OpEx:	N/A	Design/Development Costs: N/A	
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	2	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion		Avoided damages

	1	1	0
	Institutional co-benefits		
	Improve institutional capacity or efficiency	Enhances legislative environment	
	0	0	

SW7: Construct a clean material recovery facility and establish recycling programme					
Strategic objective(s)	SO6: Improve resource management by increasing solid waste management regimes efficiency SO9: Upgrade waste management infrastructure				
Challenges	Priority environmental challenge		Related pressure		
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.		(Sw1) Solid waste disposal practices (In1) Industrial solid waste disposal practices.		
Description What will be done?	GAM will develop a Material Recovery Facility (MRF) that will enable waste recycling. In addition to the construction of the MRF, GAM will also develop the requisite capital and operational tools (e.g. route planning, trucks, personnel, recycling bins). This work will build on the findings of SW1 "Waste prevention and recycling strategy".				
Rationale Why is it being proposed?	A waste sorting depot and recycling facility will help to reduce the overall carbon impact of the waste produced by the city and to increase the lifecycle of whatever materials are sorted (metals, plastics, paper, etc). Collection of recyclable waste will also reduce the need for landfill space, and generate economic opportunities in the recycling sector within the city.				
Steps for implementation	1. Undertake stakeholder engagement to determine extent of any existing informal recycling activities and the needs of existing recycling businesses. 2. Undertake a feasibility study to identify target waste streams, types of collection (separate), collection requirements (type, number and locations of bins and vehicles) and implementation schedule. This also includes a market study on recyclables (offtakes, demand, prices) and links to potential Extended Producer Responsibility legislation on the national scale. 3. Determine the preferred approach to funding and procurement. 4. Develop designs, specifications and contracts for construction and operation. 5. Procure and supervise works. 6. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
Type of action	Capital Project				
Plan for delivery	Action owner	Environmental and Solid waste Directorate			
	Stakeholders	Informal recycling sector General public Waste contractors Commodity importers/exporters			
	Financing options	Municipal Budget; PPP (potentially bundled with Action 91, 600, 602)			
	Revenue/savings opportunities	Potential revenue from sale of recycled materials, but dependent on global commodity prices which can fluctuate considerably.			
	Timeline	2020 – 2030			
Impact measures	State indicators: <ul style="list-style-type: none">Concentration of mercury, cadmium, mineral oil and zinc in soil Pressure indicators: <ul style="list-style-type: none">Share of population with weekly municipal solid waste MSW collection% of MSW which is sorted and recycled				
Estimated costs	CapEx: € 7,000,000 – € 12,500,000		OpEx: TBC	Design/Development Costs: TBC	
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	0	1	1	0
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion		Avoided damages
	1		2		0
	Institutional co-benefits				
	Improve institutional capacity or efficiency		Enhances legislative environment		
0		0			

FINAL DRAFT

5.4 Integrated water resources management

The quality and availability of water is critical to life. As a city in a water-scarce region, Amman has already taken action, in conjunction with the national government, to pursue adequate and efficient supply and reuse of its water, although there is remains opportunity to expand efforts. However, water resource management goes beyond provision of water and wastewater to citizens, and is intrinsically tied to ecosystems and land use. For example, key challenges in Amman include flash flooding and desertification, which are two extremes of the water cycle largely driven by Amman's topography combined with land use change as the city grows. These challenges are a risk to human health and well-being and place a burden on the financial resources of the city and all those impacted.

To address the key role that water resources play in the functioning of the city, GAM has prioritised the pursuit of integrated water resources management (IWRM). As noted, IWRM is embedded within land use and, therefore, many of the actions outlined in this section will be complemented by those proposed in Chapter 5.4. Specifically, GAM will pursue the following strategic objectives:

Strategic objectives		Related pressure and priority environmental challenges
SO10	Reduce flood risk in critical areas by 50% by 2040	Pc2, Pc4, Pc6, Wc1, Wc2, Wc3, Wc4, Lu1, Lu2
SO11	Reduce water network losses by 70% by 2040	
SO12	Improve access to water and wastewater networks to 100% of Amman's by 2040	
SO13	Improve water efficiency in buildings by 25% by 2030.	

The proposed actions aim to incorporate nature-based solutions alongside structural measures to **better manage flood risk while enhancing water quality**. Additionally, the actions seek to **upgrade and extend critical water infrastructure** to ensure residents have access to clean water and are connected to wastewater networks. Finally, the actions also aim to improve the efficient management of water resources by **integrating efficient systems into the built environment**.

Investment actions

Action ID	Action title	Related SO	Total costs
W1	Develop water conveyance and/or storage to reduce flood risk	SO10	€ 700,000 – € 740,000
W2	Ain Ghazal Treatment Plant decommissioning and upgrade	SO12	€ 11,750,000
W3	Develop Al Ghabawi Septic Tank Facility	SO12	€ 29,610,000
W4.1	Pilot SuDs implementation on municipal property	SO10	€ 9,400,000 – € 13,710,000
W5	Implement nature-based solutions for Ruseiffa natural lagoon	SO10, SO11, SO13	€ 5,200,000 (Phase 1)

Enabling actions

Action ID	Action title	Related SO	Total costs
W4	Integration of WSUD and SuDS	SO10	€ 24,000 – € 36,000
W6	Upgrade and expand access to water and wastewater networks	SO12	€ 930,000 (Design)

W1: Develop water conveyance and/or storage to reduce flood risk					
Strategic objective(s)	SO10: Reduce flood risk in critical areas by 50% by 2040				
Challenges	Priority environmental challenge		Related pressure		
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks		(Wc1) Hydrological changes due to climate change (Wc4) Diffuse urban pollution		
Description <i>What will be done?</i>	GAM will map the flow of water through the city and develop a conveyance or storage system which will divert floodwaters from flooding two critical areas at risk in Amman's downtown area.				
Rationale <i>Why is it being proposed?</i>	In diverting floodwaters there will be notable economic savings due to mitigated impacts on infrastructure downtown. The divergence of flood waters supports reducing pressures on sewerage systems (reducing the risk of waste water pollution incidences and reducing the energy required to process water which enters sewage systems).				
Steps for implementation	1. Collect all studies / reports addressing Amman's hydrological situation and flood management, analyse and assess them and identify previous recommendations for flood management. 2. Assemble a team of Hydrologists, civil engineers and academics to prioritise interventions. 3. Quantify flood volumes and flowrates, timings and accumulation points (using historical data, digital elevation models, topographic maps, rainfall runoff models, etc.). 4. Design an engineering solution to mitigate flooding at the high-risk areas. Conduct life cycle assessment and environmental impact assessment, and design a monitoring plan. 5. Implement the design through a tendering process. 6. Monitor and evaluate the performance of the intervention and collect rain and runoff data.				
Type of action	Capital project				
Plan for delivery	Action owner	Engineering Directorate			
	Stakeholders	GAM, Ministry of Water and Irrigation, Urban hydrologists			
	Financing options	Municipal budget; international financial institutions; Land Value Capture			
	Revenue/savings opportunities	This system will reduce damages to people and assets in these flood zones, thereby saving significant money in repair costs and losses.			
	Timeline	2021 - 2026			
Impact measures	State indicators <ul style="list-style-type: none">Percentage of households at riskPercentage of public infrastructure at riskEstimated economic damage from natural disasters Pressure indicators: <ul style="list-style-type: none">Awareness and preparedness to natural disasters% of dwellings damaged by the most intense flooding in the last 10 years				
Estimated cost	CapEx: No costing available	OpEx: No costing available	Design/Development Costs: € 700,000 - € 740,000		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	2	2	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion		Avoided damages
	0		1		2
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
2			2		

W2: Ain Ghazal Treatment Plant decommissioning and upgrade					
Strategic objective(s)		SO12: Upgrade water network and infrastructure			
Challenges	Priority environmental challenge		Related pressure		
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks		(Wc2) Coverage of sewerage network (Wc4) Diffuse urban pollution		
Description <i>What will be done?</i>	GAM will undertake a project to upgrade and expand of the existing wastewater pre-treatment facility. The facility will be upgraded to double the existing treatment capacity to meet the 2045 design horizon. Additionally, the upgrade will incorporate innovative measures to enhance the efficiency and circularity of the wastewater treatment cycle. This will include energy capture through technologies such as the Cambi anaerobic digestion system. Similarly, the efficiency of the wastewater treatment plant will be prioritised through methods such as NxPress technology that aims to decrease the amount of energy it takes to aerate wastewater. This action should also be considered in conjunction with SW4 "Construct an additional landfill cell" as it will likely contribute to the financing of the anaerobic digestion plant. Wastewater biosolids will act as a revenue stream for the city as they will generate energy from anaerobic digestion. The facility will be constructed next to existing installations to allow joint use of key infrastructure. This will be followed by the decommissioning of the septic tank facility. The septic tank discharge facility at Ain Ghazal has been deemed unfit for purpose and will be decommissioned as a replacement facility is built in another location.				
Rationale <i>Why is it being proposed?</i>	Wastewater infrastructure services have been unable to keep up with the growing pressures from the rapid population increase Amman and the surrounding areas have experienced since 2011. The original Ain Ghazal treatment facility initially constructed in 1968 and is constrained with a capacity for a daily flow of 267,000m³/d. An additional 369,120m³ is required to align with the 2045 horizon. Under peak flow conditions wastewater is not pre-treated and is sent directly to the Samra wastewater treatment plant which causes significant problems for operations mainly due to clogging.				
Steps for implementation	<ol style="list-style-type: none">1. Feasibility study to identify site requirements, construction plans, and implementation schedule.2. Determine preferred approach to procurement.3. Develop designs, specifications and contracts for construction and operation.4. Procure and supervise works.5. Expand and upgrade the existing pre-treatment facility to increase capacity and improve efficiency.6. Replace existing scraper at grit channel.7. Replace 2 existing blowers with 3 new ones.8. Replace existing auxiliary facilities, new operation building.9. Upgrade and expand existing facilities between MH69 and screening.10. Install new odour control unit.11. Decommissioning of the septic tank facility and waste removal.				
Type of action	Capital project				
Plan for delivery	Action owner	Water Authority of Jordan under the Ministry of Water and Irrigation			
	Stakeholders	Miyahuna Water Company, Samra Project Company			
	Financing options	Sovereign loan			
	Revenue/savings opportunities	Improving the efficiency and capacity of treatment plants will streamline the wastewater treatment processes, reducing costs in the long-term, - particularly around maintenance, as there will be less pressure on the Samra WWTP.			
	Timeline	2020			
Impact measures	State indicators: <ul style="list-style-type: none">• BOD in rivers and lakes Pressure indicators: <ul style="list-style-type: none">• Percentage of city population served by wastewater collection• Percentage of city's wastewater that has received no treatment				
Estimated cost	CapEx: € 11,750,000		OpEx: N/A		Design/development costs: N/A
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity

	1	2	2	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	3		1	2	
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
	2			2	
W3: Develop Al Ghabawi Septic Tank Facility					
Strategic objective(s) SO12: Improve access to water and wastewater networks					
Challenges	Priority environmental challenge			Related pressure	
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC6) Management of intensifying drought and overheating risks			(Wc2) Coverage of sewerage network	
Description What will be done?	The construction of a new 22,500 m³ per day capacity septic tank drop off and wastewater treatment facility, which will replace the existing facility currently co-located at the Ain Ghazal Treatment Plant; which is being decommissioned under Action W2 "Ain Ghazal Treatment Plant decommissioning and upgrade". The new facility will be at Al Ghabawi and will service approximately 840,000 citizens who are currently unsewered.				
Rationale Why is it being proposed?	Wastewater infrastructure services have been unable to keep up with the growing pressures from the rapid population increase Amman and the surrounding areas have experienced since 2011, primarily due to the influx of 600,000 Syrian refugees. The septic tank discharge facility at Ain Ghazal has been deemed unfit for purpose and will be decommissioned, creating requirements for a replacement facility to be built.				
Steps for implementation	1. Develop designs, specifications and contracts for construction and operation. 2. Support tender process. 3. Procure and supervise works. 4. Construct and commission new facility. 5. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
Type of action	Capital project				
Plan for delivery	Action owner	Ministry of Water and Irrigation			
	Stakeholders	GAM, Urban hydrologists			
	Financing options	Co-financed sovereign loan from EBRD and a donor (Donor contribution of USD 32.5 million required)			
	Revenue/savings opportunities	Loan and grant proceeds will be made available to the Government of Jordan based on invoices confirming the use of proceeds (invoices are paid directly to contractors on completion of agreed milestones). Overall, GAM will likely see a long-term reduction in maintenance costs and increased energy efficiency.			
	Timeline	2 years (construction is expected to be completed in 2 years)			
Impact measures	State indicators: • BOD in rivers and lakes Pressure indicators: • Percentage of city population served by wastewater collection • Percentage of city's wastewater that has received no treatment				
Estimated cost	CapEx: € 29,610,000		OpEx: N/A		Design/development costs: N/A
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	2	2	0	2	1

	Economic co-benefits		
	Revenue generating activities	Promotes economic inclusion	Avoided damages
	1	1	2
	Institutional co-benefits		
	Improve institutional capacity or efficiency		Enhances legislative environment
	3	0	
W4: Integration of WSUD and SuDS			
Strategic objective(s)		SO10: Reduce flood risk in critical areas by 50% by 2040	
Challenges	Priority environmental challenge		Related pressure
	<p>PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity</p> <p>(PEC4) Delivery of high quality, accessible and biodiverse green infrastructure</p> <p>(PEC5) Management of increasing urban flash flooding risks</p> <p>(PEC6) Management of intensifying drought and overheating risks</p>		<p>(Wc1) Hydrological changes due to climate change</p> <p>(Wc4) Diffuse urban pollution</p> <p>(Lu1) Competing land use priorities and pressures</p> <p>(Lu2) Desertification</p>
Description	The integration of WSUD (water-sensitive urban design) and SuDS (sustainable urban drainage system) principles into land use planning and regulation is critical. WSUD and SuDS integrate the water cycle more effectively into urban design. GAM will put forward SuDS principles into new land-use plans and provide a SuDS principles guidance document for departments revising related regulations and codes (e.g. road maintenance) to combat flooding and promote efficient and environmentally-sound water use.		
Rationale	WSUD and SuDS allow for a city to better manage water flows, both in times of drought and in flooding conditions. As climate change worsens, issues regarding the appropriate management of water will become critically important. These innovative design and drainage systems will help to protect infrastructure and the communities within the city. Moreover, they protect existing natural features and ecological processes and protect the water quality of surface water.		
Steps for implementation	<ol style="list-style-type: none">Review and update green building guidelines used in Jordan, particularly portions related to efficient water management.Compile a database of various WSUD and SuDS technologies that can be utilised (similar databases for Low Impact Development techniques are available online).Identify measures to be incorporated in the Jordan Building Code in coordination with national ministries, thus becoming mandatory for new projects.For the remaining identified measures in the database, devise an incentives program, similar to that proposed by GAM for the green buildings, to encourage uptake of WSUD and SuDS technologies.Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.		
Type of action	Policy		
Plan for delivery	Action owner	Planning Directorate	
	Stakeholders	GAM, Urban hydrologists, national government stakeholders	
	Financing options	Municipal budget	
	Revenue/savings opportunities	Avoided damages and increased water efficiency	
	Timeline	2020 -2021	
Impact measures	State indicators: <ul style="list-style-type: none">Water exploitation indexPercentage of households at riskPercentage of public infrastructure at risk		
	Pressure indicators: <ul style="list-style-type: none">Awareness and preparedness to natural disasters% of dwellings damaged by the most intense flooding in the last 10 years		
Estimated cost	Design/Development Costs: € 24,000 - 36,000		
Estimated co-benefits	Social co-benefits		

FINAL DRAFT

	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	2	2	0	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	0		2	2	
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
	2			2	

W4.1: Pilot SuDS implementation on municipal property

Strategic objective(s)	SO10: Reduce flood risk in critical areas by 50% by 2040	
Challenges	Priority environmental challenge	Related pressure
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks	(Wc1) Hydrological changes due to climate change (Wc4) Diffuse urban pollution (Lu1) Competing land use priorities and pressures (Lu2) Desertification
Description <i>What will be done?</i>	The city will incorporate Sustainable Drainage Systems (SuDS) principles into all existing and planned publicly-owned buildings. GAM can identify suitable sites for pilot projects for SuDS developments as part of new municipal works and upgrades of existing public-owned buildings. Hydrological changes are expected due to climate change, so the incorporation of SuDS into city planning will help to reduce the impacts of flooding and help to secure a more reliable supply of water. For the planting component of the programme, SuDS will focus on xeriscaping and drought-tolerant planting.	
Rationale <i>Why is it being proposed?</i>	SuDS programmes around the world have been successful in mitigating the damages related to flooding by capturing water at source and managing it locally. SuDS can also help to collect water and store that water in times of drought, improving water security in this changing climate.	
Steps for implementation	<ol style="list-style-type: none"> 1. Create a list / map of municipality and publicly owned properties, rank by total area and area suitable for SuDS implementations (parks, green spaces etc.) 2. Identify suitable types of SuDS (green roofs, infiltration trenches, retention and detention basins, pervious sidewalks, etc.) for each location. 3. Develop designs and specifications and perform an environmental impact analysis. 4. Secure funds and start implementation 5. Monitor runoff from existing properties before and after SuDS implementation to verify its impact and develop a case for securing more funding in the future. 	
Type of action	Capital project	
Plan for delivery	Action owner	Planning Directorate OR Engineering Directorate
	Stakeholders	GAM, Ministry of Public Works, Urban hydrologists
	Financing options	Municipal budget;
	Revenue/savings opportunities	Overall, implementing SuDS can improve the water efficiency of municipal buildings, decreasing costs over time.
	Timeline	2020 – 2030
Impact measures	State indicators: <ul style="list-style-type: none"> • Water exploitation index • Percentage of households at risk • Percentage of public infrastructure at risk Pressure indicators: <ul style="list-style-type: none"> • Water consumption per capita • Awareness and preparedness to natural disasters • % of dwellings damaged by the most intense flooding in the last 10 years 	
Estimated cost	CapEx: € 9,400,000 – € 13,710,000	OpEx: N/A Design/Development Costs: N/A

W5: Implement nature-based solutions for Russeifa Lagoon					
Strategic objective(s)	SO10: Reduce flood risk in critical areas by 50% by 2040 SO14: Increase the amount of quality green space in Amman				
Challenges	Priority environmental challenge		Related pressure		
	(PEC4) Delivery of high quality, accessible and biodiverse green infrastructure		(Wc1) Hydrological changes due to climate change		
	(PEC5) Management of increasing urban flash flooding risks		(Wc4) Diffuse urban pollution		
	(PEC6) Management of intensifying drought and overheating risks		(Lu1) Competing land use priorities and pressures (Lu2) Desertification		
Description <i>What will be done?</i>	The city seeks to implement nature-based solutions to address Russeifa Lagoon, colloquially known as 'Pepsi Pond.' The Russeifa Lagoon collects debris and detritus and is a well-known area of pollution. GAM intends to study the wadi flow patterns to understand where debris collects and from where it transmits, and will implement necessary nature-based solutions (e.g. restoring the wadi area with native plants to provide buffer zones). EBRD has proposed an environmental infrastructure project related to the urgent remediation and prevention of the Pepsi Pond (which is approximately 200,000 m ²). Phase 1 involves the remediation of the lagoon, and Phase 2 involves the urban regeneration of the area, including the development of a municipal park and green spaces covering the entire area . GAM will be responsible for undertaking Phase 2. This project will link to LU11 "Improve public realm infrastructure".				
Rationale <i>Why is it being proposed?</i>	This project seeks to mitigate diffuse urban pollution and to improved greater public open space to residents in the area.				
Steps for implementation	Phase 1 (Identification and prevention) 1. Perform extensive site surveys along the Wadis on the upstream direction to identify plants/ industries/ businesses, contributing by discharge to the water reaching the pond. Aerial and satellite images can be used as supplementary sources. 2. Setup a real time stream flow gage monitoring program to quantify discharge from the different streams. 3. Identify and stop any illegal discharges to the pond area from the neighbouring industries and residents. 4. Design and construct water drainage infrastructure (e.g. micro-tunnelling) connecting the pond area to the Zarqa River, from which water will flow naturally. Phase 2 (nature-based solution) 5. Identify suitable indigenous plant species and plant them throughout the area. 6. Design and develop municipal park. 7. Monitor and evaluate project performance and where improvements are identified, implement actions accordingly.				
Type of action	Capital project				
Plan for delivery	Action owner	Design and Planning Environmental Department			
	Stakeholders	GAM, Ministry of Agriculture, Ministry of the Environment, Jordan Valley Authority			
	Financing options	Municipal budget; Donor agency; Land Value Capture			
	Revenue/savings opportunities	Reduced damages from flooding, potential revenue from municipal park. Reduced costs from pollution impacts.			
	Timeline	2020 - 2025			
Impact measures	State indicators: <ul style="list-style-type: none">Percentage of households at riskConcentration of mercury, cadmium, mineral oil and zinc in pond water and sediment.Percentage of public infrastructure at risk Pressure indicators: <ul style="list-style-type: none">Awareness and preparedness to natural disasters% of dwellings damaged by the most intense flooding in the last 10 years				
Estimated cost	CapEx: € 5,200,000 (Phase 1)		OpEx: N/A		Design/Development Costs: N/A
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	2	0	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion		Avoided damages

	0	2	1
	Institutional co-benefits		
	Improve institutional capacity or efficiency	Enhances legislative environment	
	0	0	

W6: Upgrade and expand access to water and wastewater networks			
Strategic objective(s)	SO12: improve access to water and wastewater networks		
Challenges	Priority environmental challenge	Related pressure	
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks	(Wc1) Hydrological changes due to climate change (Wc2) Coverage of sewerage network (Wc3) Non-revenue water losses (Lu2) Desertification	
Description <i>What will be done?</i>	The city will upgrade their water distribution network and infrastructure. GAM, potentially with the support of an MDB, will begin rehabilitating the potable water network to reduce water losses. This will incorporate smart technologies for rapid leak detection. GAM will also partner with other water utilities in a twinning program to learn from their experience in reducing water loss. The program will be implemented over two years with site inspections, dedicated training sessions and potentially the secondment of one water utility expert for a limited amount of time into the water authority. A component of this action will be to reduce water losses from leaks.		
Rationale <i>Why is it being proposed?</i>	Non-revenue water losses are a major issue that must be addressed to improve water security and increase overall water distribution efficiency. This issue is particularly important as droughts brought upon by climate change will worsen water security for the city.		
Steps for implementation	<div><div>1.</div><div>In collaboration with the Miyahuna water company and the Ministry of Water and Irrigation, develop a database for waterline breakage complaints, analyse, then identify regions with high occurrence (or potential of occurrence) of pipe failures.</div></div> <div><div>2.</div><div>Obtain records from Miyahuna water company of the regions of highest difference between pumped water and billed water, thus regions of highest non- revenue water losses.</div></div> <div><div>3.</div><div>From the records obtained above, analyse the data to identify any suspicious water usage patterns (thus potentially indicating illegal connections). Perform site visits and verifications of the legitimacy of the use.</div></div> <div><div>4.</div><div>In collaboration with the Miyahuna water company, perform water leak tests (e.g. ultrasonic) to identify pipes with leakage, then replace leaking pipes</div></div> <div><div>5.</div><div>In collaboration with the Miyahuna water company, perform flow balance analysis on the pump stations, as inaccurate metering may be one cause of non-revenue water.</div></div> <div><div>6.</div><div>Based on the reasons and issues of non-revenue water, conduct a preliminary assessment of the technical measures to address non-revenue water and the impact on GAM/water utilities.</div></div> <div><div>7.</div><div>Complete the PPP Project Preparation Cycle steps.</div></div> <div><div>8.</div><div>Monitor and evaluate non-revenue water loss.</div></div>		
Type of action	Capital Project		
Plan for delivery	Action owner	Engineering Directorate	
	Stakeholders	WAJ, Miyahuna water company	
	Financing options	Municipal budget; Donor agencies; international financial institutions	
	Revenue/savings opportunities	Decreased cost of maintenance on leaks and damage to the network.	
	Timeline	2020 -2025	
Impact measures	State Indicators: <ul style="list-style-type: none">• Percentage of households at risk• Percentage of public infrastructure at risk Pressure Indicators: <ul style="list-style-type: none">• Non-revenue water• Annual average of daily number of hours of continuous water supply per household		
Estimated cost	CapEx: No costing available	OpEx: No costing available	Design/Development Costs: € 930,000

5.5 Comprehensive and reflective land-use planning

Land use planning provides the foundation upon which the patterns of urban life are laid. It dictates access to opportunities and services, how easily people can get from place to place, and contributes to the health or degradation of ecosystem services, all of which contribute to the wellbeing of the city's residents. This includes ensuring maximising green infrastructure, which can mitigate a host of environmental challenges, support biodiversity and serve to better regulate the urban microclimate whilst providing an attractive setting for recreation.

The below strategic objectives and proposed actions aims to create a comprehensive regulatory environment that will provide clear standards and protocols for development and prioritise the inclusion of green infrastructure that enhances the public realm and helps mitigate environmental challenges.

Strategic objectives		Related pressure and priority environmental challenges
SO14	Increase the amount of quality green space in Amman	Pc2, Pc4, Pc6, Pc8, Pc8, Tr1, Tr2, Wc1, Lu2
SO15	Develop an up-to-date land use plan to ensure equitable development across Amman	
SO16	Improve the public realm	

The proposed actions around land use seek to **create a comprehensive regulatory environment** that will provide clear standards and protocols for development and **prioritise the inclusion of green infrastructure** to enhance the public realm and mitigate environmental challenges including flooding and the urban heat island effect.

Investment actions:

Action ID	Action title	Related SO	Total costs
LU1	Invest in expanding green spaces	SO13, SO14, SO15	€ 350,000 – € 530,000

Enabling Actions:

Action ID	Action title	Related SO	Total costs
LU1.1	Develop an integrated green infrastructure strategy	SO13, SO15	€ 260,000 – € 400,000
LU2	Develop a servicing and implementation plan for East Amman	SO15	€ 80,000 – € 120,000
LU3	Finalise and implement the Amman Strategic Master Plan 2060	SO14	€ 830,000 – € 1,280,000
LU4	Establish a centralised GIS database	SO15	€ 30,000 – € 50,000

LU1: Invest in expanding green spaces		
Strategic objective(s)	SO14: Increase the amount of quality green space in Amman SO15: Develop an up-to-date land use plan to ensure equitable development across Amman SO16: Improve the public realm	
Challenges	Priority environmental challenge	Related pressure
	PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks	(Wc1) Hydrological changes due to climate change (Lu2) Desertification
Description <i>What will be done?</i>	Through the investment of green infrastructure, the city will see both social and environmental benefits. We will implement the strategy developed in LU1.1 "Develop an integrated green infrastructure strategy" and work to link together over 143 parks and gardens with micro-scale green infrastructure, such as street trees and green roofs. These changes will attract birds, insects and other species that support a healthy thriving ecosystem. Additionally, GAM will work to integrate this with actions T2 "Conduct pilot project to promote active mobility" and LU3 "Finalise and implement the Amman Strategic Master Plan 2060" to ensure green infrastructure is part of a functional use of urban space and transport. GAM will ensure that plants are native and drought tolerant.	
Rationale <i>Why is it being proposed?</i>	Green infrastructure (or a network of multi-functional green space and other green features) can deliver quality of life and environmental benefits for the city of Amman. Green areas set aside for sports, relaxation and activities, contribute to a healthy lifestyle while protecting vulnerable wildlife habitats and retaining the essential natural character of the landscape. Boulevards, plazas, green roofs and walls make attractive settings for green space. The conversion of these spaces to green space can counteract the effects of increasing building heights and the effect on local bird population.	
Steps for implementation	<ol style="list-style-type: none"> 1. Develop a stakeholder engagement plan for the project. These should include government representatives of GAM, Ministry of Environment, and Ministry of agriculture, Ministry of Health, Ministry of Transport, and Ministry of Public Works, local groups and social and environmental NGOs. Identify local issues, challenges, risks and community needs using data audit and consultation. 2. Encourage these groups to participate in assessing the issues they face, through engagement methods such as workshops , etc. 3. Leverage the information and data collected from action LU1.1, where experts in the relevant sectors e.g. biodiversity and hydrology, have already been engaged. In addition, identify GAM policies and existing plans that overlap with the strategy. 4. Link in with the fund for green spaces (LU7 "Regenerate derelict or vacant land") and identify financing opportunities 5. Record green assets and identify ownership, primary uses and potential viability, using geographic information systems (GIS) where appropriate, to deliver multifunctional benefits. 6. Assess the possibility of transformation of non-agricultural land into agricultural land to fit with existing land use classification and consider land acquisition by the municipality. 7. Assess, incentivise and enforce roof top use for green usage. It will subside the effects of increasing building heights and effect on local bird population. Develop a green infrastructure plan based on the information collected in the previous steps and set goals and targets to be achieved. An action plan including timeline, responsibilities, options, as well as reporting mechanisms; should be produced. 8. Develop an overarching plan, with key projects, stakeholders and financing identified. This plan should work with the community engagement from the strategy (LU1.1). 9. Implement and monitor the plan according to set timeline. 	
Type of action	Capital project	
Plan for delivery	Action owner	Public Facilities and Gardens Directorate
	Stakeholders	Environment & Energy conservation NGOs, Ministries of Environment, Agriculture, Transportation, and Public works
	Financing options	Municipal Budget
	Revenue/savings opportunities	There is potential for GAM to generate revenue from user fees in parks; for example, through permitting for events etc.
	Timeline	2020 - 2030
Impact measures	State Indicators: <ul style="list-style-type: none"> • Open green space area m2/capita 	

	<ul style="list-style-type: none">Share of green space areas within urban limits Pressure Indicators: <ul style="list-style-type: none">Percentage of urban development on existing urban land rather than greenfield land				
Estimated cost	CapEx:	€ 350,000 – € 530,000	OpEx:	N/A	Design/Development Costs: N/A
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	2	2	1	1
	Economic co-benefits				
	Revenue generating activities	Promotes economic inclusion		Avoided damages	
	2	2		2	
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
	0			0	
	CO ₂ Savings		165 tCO ₂		

LU1.1: Develop an integrated green infrastructure strategy		
Strategic objective(s)	SO14: Increase the amount of quality green space in Amman SO16: Improve the public realm	
Challenges	Priority environmental challenge (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure	Related pressure (Lu1) Competing land use priorities and pressures (Lu2) Desertification (Tr2) Poor pedestrian infrastructure
Description <i>What will be done?</i>	The development of a green infrastructure strategy will help to create links to connect all existing networks of green spaces. GAM will develop a strategy to connect all existing networks of green space that promotes accessibility, inclusivity, pedestrian safety, and social interaction. GAM will also work to identify new areas of network corridors required. Other areas, mostly in East Amman, should be identified, shortlisted, and integrated in this strategy. These will need to be adapted as necessary to local land use classifications.	
Rationale <i>Why is it being proposed?</i>	The provision of green space is critical to the overall liveability of a city. Green space connectivity supports healthier populations of wildlife and allows for greater pedestrian connectivity (and overall enjoyment of the space.)	
Steps for implementation	<ol style="list-style-type: none"> 1. Identify and engage stakeholders and collaborative groups. These should include government representatives of GAM, Ministry of Environment, and Ministry of Agriculture, Ministry of Health, Ministry of Transport, and Ministry of Public Works, local/community groups and social and environmental NGOs. 2. Encourage these groups to participate in assessing the issues they face and opportunities through workshops, media, or any other useful methodologies. 3. Engage experts in the early stages. These should cover areas of concern such biodiversity, hydrology, design and landscape architects, transportation among others. They will assist in redesign of existing garden and green areas in Amman. Other areas, mostly in East Amman, should be identified, shortlisted, and integrated in this strategy. These will need to be adapted as necessary to local land use classifications. 4. Outline relevant GAM policies and existing plans. 5. Identify existing status and features of the GAM area and how it could be improved. 6. Assess the possibility of transformation of non-agricultural land into agricultural land to fit with existing land use classification. 7. Assess potential for roof top use for green spaces. 8. Develop a green infrastructure strategy, by including setting goals and targets to be achieved. 9. Produce a strategy with a built in action plan, including timeline, responsibilities, options, as well as reporting mechanisms. 	
Type of action	Plan/Strategy	
Plan for delivery	Action owner	Planning Directorate
	Stakeholders	Ministries of Agriculture and Environment. Green NGOs.
	Financing options	Municipal budget;
	Revenue/savings opportunities	Green infrastructure improves the social and economic value of nearby space. GAM can use this strategy to promote sales for events in municipal parks and in other municipal green space, while ensuring that the spaces themselves remain freely accessible.
	Timeline	2020 - 2023
Impact measures	State Indicators: <ul style="list-style-type: none"> • Number of contaminated sites • Green space ratio • Abundance of bird and other species Pressure Indicators: <ul style="list-style-type: none"> • Percentage of urban development on existing urban land rather than greenfield land • Population density on urban land • Average commuting distance • Average commuting time • % of population living within 20 minutes of basic services 	
Estimated cost	Design/Development Costs: € 260,000 – € 400,000	
	Social co-benefits	

Estimated co-benefits	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	2	1	2	0	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion	Avoided damages	
	1		0	1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency			Enhances legislative environment	
	0			0	

LU2: Develop a servicing and implementation plan for East Amman					
Strategic objective(s)	SO14: Improve the public realm				
Challenges	Priority environmental challenge		Related pressure		
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices. (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks		(Wc1) Hydrological changes due to climate change (Lu1) Competing land use priorities and pressures (Tr1) Lack of public transport infrastructure (Tr2) Poor pedestrian infrastructure		
Description <i>What will be done?</i>	East Amman is historically underserved with regard to critical infrastructure and economic opportunity in comparison to West Amman. Therefore, GAM is interested in developing a servicing and implementation plan to attract public and private sector investment to provide services and opportunities to residents of East Amman. This plan will map areas of social vulnerability and lack of service provision. It will then develop a clear and holistic strategy to identify areas of key social and physical infrastructure to improve connections within East Amman and into and out of the area. This will include neighbourhood-level planning to identify potential areas or sectors for private vs. public sector investment. The implementation component will identify costs and potential funding streams, alongside indicative timelines for the delivery of the plan.				
Rationale <i>Why is it being proposed?</i>	East Amman has significant potential for development to improve the quality of the services presently available to its residents, who typically have lower economic means compared to West Amman. By developing East Amman, pressure on West Amman, which is becoming saturated, can be reduced and socioeconomic and environmental benefits can be provided to East Amman residents.				
Steps for implementation	<ol style="list-style-type: none">1. Assess service capabilities, needs, and requirements in East Amman (GAP Analysis).2. Review the existing infrastructure and land use classification in East Amman.3. Review points of interest, attractions, and services existing in West Amman which can be replicated in East Amman. Consider these as possible options for implementation in East Amman.4. Conduct and encourage stakeholder and local participation.5. Select areas for potential green improvement. Select leadership and project champions and state the green benefits of such area.6. Review the financial requirements to deliver services. Local groups and individuals should be encouraged to invest in their areas.7. Consult residents and other stakeholders in East Amman and encourage local initiatives. Review service offerings and stakeholders' segmentation.8. Prepare an implementation plan and timeline.9. Allocate budget to include incentives for locals and investors.				
Type of action	Plan/Strategy				
Plan for delivery	Action owner	Supply Chain Management and Investment Directorate; Planning Directorate			
	Stakeholders	Environmentl & Energy conservation NGOs, Ministries of Environment, Agriculture, Transportation, and Public works. Locals of East Amman. Chambers of industry and commerce.			
	Financing options	Municipal budget; international financial institutions ;			
	Revenue/savings opportunities	The aim of this action is to bring investment and services into East Amman. This will in turn generate municipal revenue through increased user fees of its services, alongside the broader benefits of improving economic activity.			
	Timeline	2020 - 2022			
Impact measures	State indicators: <ul style="list-style-type: none">• N/A Pressure indicators: <ul style="list-style-type: none">• Percentage of urban development on existing urban land rather than greenfield land• Population density on urban land• Average commuting distance• Average commuting time• % of population living within 20 minutes of basic services				
Estimated cost	Design/Development Costs:		€ 80,000 – € 120,000		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity

	1	2	2	2
	Economic co-benefits			
	Revenue generating activities	Promotes economic inclusion	Avoided damages	
	2	2	2	
	Institutional co-benefits			
	Improve institutional capacity or efficiency		Enhances legislative environment	
	1		0	

LU3: Finalise and implement the Amman Strategic Master Plan 2060					
Strategic objective(s)		SO15: Develop an up-to-date land use plan to ensure equitable development across Amman			
Challenges	Priority environmental challenge		Related pressure		
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks		(Wc1) Hydrological changes due to climate change (Wc4) Diffuse urban pollution (Lu1) Competing land use priorities and pressures (Tr1) Lack of public transport infrastructure (Tr2) Poor pedestrian infrastructure		
Description What will be done?		The city seeks to finalize and implement the Amman Strategic Master Plan 2060 proposed in the 2016 Amman Resilience Strategy. Amman's most recent masterplan was developed in 2008 and population growth alongside changes in municipal boundaries in the ensuing years has meant this masterplan is now out-of-date. The Amman Strategic Master Plan 2060 plan will take into account future population and climate projections, prioritising functional, low-carbon and resilient urban development .Moreover it will incorporate international best practice and evidence-based solutions to Amman's unique urban planning context.			
Rationale Why is it being proposed?		Strategic planning, or a comprehensive strategic master plan, is critical to sustainable and holistic growth.			
Steps for implementation		1. Review green growth plans in GAM. 2. Assess mobility, transport, and walkability around Amman. 3. Review street plans. 4. Prepare priority lists of crowded areas. 5. Assess and review existing land use classification. The possibility of change should be explored based on green infrastructure strategies and plans. 6. Provide stability and sustainable land use classifications. 7. Explore and provide new directions of the master plan into east and southeast Amman. 8. Promote application and incentivise implementation of green building codes. 9. Incorporate the above into the Amman Strategic Master Plan 2060 and finalise and implement the plan.			
Type of action		Policy			
Plan for delivery	Action owner		Planning Directorate		
	Stakeholders		Ministries of Environment, Agriculture, Transport, Public works, Green NGOs, Jordan Engineers Association, and National building council.		
	Financing options		Municipal budget		
	Revenue/savings opportunities		TBC		
	Timeline		2020 - 2022		
Impact measures		State indicators: <ul style="list-style-type: none">Open green space area m2/capitaShare of green space areas within urban limits Pressure indicators: <ul style="list-style-type: none">Percentage of urban development on existing urban land rather than greenfield land			
Estimated cost		Design/Development Costs: € 830,000 – € 1,280,000			
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	1	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion		Avoided damages
	1		2		1
Institutional co-benefits					

	<i>Improve institutional capacity or efficiency</i>	<i>Enhances legislative environment</i>
	1	2

LU4. Establish a centralized GIS database					
Strategic objective(s)		SO15: Develop an up-to-date land use plan to ensure equitable development across Amman			
Challenges	Priority environmental challenge		Related pressure		
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks		(Lu1) Competing land use priorities and pressures (Tr1) Lack of public transport infrastructure (Tr2) Poor pedestrian infrastructure (Wc1) Hydrological changes due to climate change (Wc2) Coverage of sewerage network (Wc3) Non-revenue water losses (Wc4) Diffuse urban pollution		
Description What will be done?		The city is interested in establishing a centralized GIS database which will capture and hold baseline data on the land use within the city. The current GIS department will receive funding to conduct site surveys to build out this database, and capacity-building training will occur whereby departments update and share their data to be input into the GIS database.			
Rationale Why is it being proposed?		The establishment of a centralized GIS database will help to ensure that planning for the city is strategic and well-informed. As the city grows, it will need to hold and maintain data on the spaces/habitats that should be protected and the areas where further growth is well suited.			
Steps for implementation		1. Consult and cooperate with stakeholders (GIS data providers such the Jordan geographic centre and Ministries) to provide any existing GIS data and maps. 2. Conduct a gap analysis of missing data and maps. 3. GIS department will conduct surveys to build out this database. 4. Update the GIS database and produce of comprehensive maps for GAM. 5. Implement bi-annual capacity building trainings for all departmental staff to encourage data sharing to continuously update GIS database.			
Type of action		Plan/Strategy			
Plan for delivery	Action owner	Directorate of planning (GAM)			
	Stakeholders	Jordan geographic centre. Ministry of environment. Ministry of agriculture. Ministry of transport.			
	Financing options	Municipal budget			
	Revenue/savings opportunities	The data provided by the GIS database will improve the efficiency of multiple municipal services and departments and support decision making, potentially decreasing municipal costs in the long-term.			
	Timeline	2020 - 2022			
Impact measures		State indicators: • Green space ratio Pressure indicators: • Percentage of urban development on existing urban land rather than greenfield land • Population density on urban land • Average commuting distance • Average commuting time • % of population living within 20 minutes of basic services			
Estimated cost		CapEx: N/A	OpEx: € 30,000 – € 50,000	Design/Development Costs: N/A	
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	0	1	1	1	1
	Economic co-benefits				
	Revenue generating activities		Promotes economic inclusion		Avoided damages
	0		0		1
	Institutional co-benefits				

	<i>Improve institutional capacity or efficiency</i>	<i>Enhances legislative environment</i>
	2	2

5.6 Responsive and forward-looking climate adaptation practices

Climate change is a cross-cutting challenge that is already being felt and will continue to impact cities. In Amman, climate change will have particular bearing on the water cycle and the urban heat island effect. Therefore, it is imperative to integrate climate-conscious projects and protocols into Amman's institutions and systems. Acting early is particularly important as Amman's continued development provides a window of opportunity to avoid becoming locked-in to maladaptive practices.

The national and municipal governments have been undertaking multiple projects to address climate risk in Amman. Building on this, GAM has emphasized the need to institutionalise responsive and forward-looking climate adaptation practices. As such, the below strategic objectives and actions have been selected, as they seek to develop overarching strategies to raise awareness and identify clear adaptation measures to address the key challenges identified.

Strategic objectives		Related pressure and priority environmental challenges
SO17	Institutionalise climate resilience into all aspects of municipal operations and policies	Pc4, Pc5, Pc7, Pc8, Lu1, Lu2, Wc1, Wc4, Es1
SO18	Mitigate or maintain the urban heat island effect and carbon emissions in Amman through blue and green infrastructure	
SO19	Improve public awareness of climate change	

The proposed actions seek to develop overarching strategies to raise awareness and identify clear adaptation measures to address the key challenges identified.

Investment actions:

Action ID	Action title	Related SO	Total costs
CA1	Develop green and/or shaded parking infrastructure	SO17	€ 5,300,000 – € 8,000,000

Enabling actions:

Action ID	Action title	Related SO	Total costs
CA2	Implement a Climate Change Community Engagement Plan	SO18	€ 100,000 – € 120,000
CA3	Develop and deliver a Flood Resilience Strategy	SO10, SO16, SO18	€ 27,000 – € 44,500

CA1: Develop green and/or shaded parking infrastructure					
Strategic objective(s)	SO18: Mitigate the urban heat island effect in Amman through blue and green infrastructure				
Challenges	Priority environmental challenge		Related pressure		
	(PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks		(Lu1) Competing land use priorities and pressures (Lu2) Desertification (Es1) Fossil-fuel dominated energy supply		
Description <i>What will be done?</i>	GAM will implement strategies to cool existing parking lots. Much of municipal property constitutes parking lots, which contribute to urban heat island effects. Additionally, parking lots account for significant unused space when they are flat and open (as opposed to underground or in a parking structure). Measures will be determined by GAM upon project scoping; however, 'green' parking will include the installation of shading devices, with structures such as retractable canopies, or the integration of permeable asphalt. Additionally, solar energy will be installed as a means of shading. This work will support climate adaptation and mitigation plans, depending on the type of green infrastructure installed. For any planting, GAM will ensure that species are drought-tolerant and focus on xeriscaping.				
Rationale <i>Why is it being proposed?</i>	Parking spaces are often considered to be a waste of valuable urban space, and implementing green parking will help to lessen the negative impact of those spaces.				
Steps for implementation	1. Conduct feasibility study to identify suitable locations for implementation. 2. Identify preferred methods of green infrastructure. 3. Set out financing and appropriate team structure. 4. Establish key milestones. 5. Establish the green infrastructure.				
Type of action	Capital project				
Plan for delivery	Action owner	Road Directorate			
	Stakeholders	GAM; suppliers; developers			
	Financing options	Municipal budget; PPP			
	Revenue/savings opportunities	Reducing the effects of urban heat island directly around municipal buildings can reduce the costs of air-conditioning .			
	Timeline	2020 - 2022			
Impact measures	State indicators: <ul style="list-style-type: none">• Concentration of mercury, cadmium, mineral oil and zinc in soil• Open green space per m²/capita• Abundance of bird and other species Pressure indicators: N/A				
Estimated cost	CapEx: € 5,300,000 – € 8,000,000	OpEx: N/A	Design/development costs: N/A		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	2	0	0
	Economic co-benefits				
	Revenue generating activities	Promotes economic inclusion		Avoided damages	
	1	0		1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency		Enhances legislative environment		
	0		0		

CA2: Implement a Climate Change Community Engagement Plan					
Strategic objective(s)	SO19: Improve public awareness of climate change				
Challenges	Priority environmental challenge		Related pressure		
	(PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks		(Lu1) Competing land use priorities and pressures (Lu2) Desertification (Es1) Fossil-fuel dominated energy supply (Wc1) Hydrological changes due to climate change		
Description <i>What will be done?</i>	They city intends to implement a Climate Change Community Engagement Plan. GAM will develop and disseminate this Climate Change Community Engagement Plan to ensure Amani's understand Amman's climate risks and opportunities. This will include additional information and early warning to residents about extreme events. This work will be provided on a recurring basis (potentially one publicised document and social media shared post each month) with the best available information and tools regarding adaptation strategies.				
Rationale <i>Why is it being proposed?</i>	It is critical that Amani citizens be engaged in the work undertaken within their communities to mitigate and adapt to climate change. With greater engagement, citizens are likely to respond well to the changes being undertaken within their city and be supportive of green infrastructure, nature based solutions and renewable energy projects. This stakeholder buy-in is critical to the success of work.				
Steps for implementation	1. Assign team roles and responsibilities. 2. Develop engagement plan based on best practice, and based on the specific audience. 3. Set out a timeline for engagement. 4. Train relevant local organisations on engagement. 5. Undertaken engagement as outlined in the plan. 6. Conduct regular engagement and feedback e.g. surveys, to identify where the engagement could be optimised.				
Type of action	Capacity-building				
Plan for delivery	Action owner	Social Media Department			
	Stakeholders	Local organisations			
	Financing options	Municipal budget			
	Revenue/savings opportunities	Enacting a Climate Change Community Engagement Plan can ultimately decrease damages incurred by climate on livelihoods and assets as Amani's become more aware of the potential impacts. Similarly, this may translate to reduced needs for the Municipality to provide recovery funds following disasters.			
	Timeline	2020 - 2021			
Impact measures	State indicators: <ul style="list-style-type: none">• Estimated economic damage from natural disasters• Percentage of public infrastructure at risk• Percentage of households at risk Pressure indicators: N/A				
Estimated cost	CapEx: N/A	OpEx: € 100,000 – € 120,000	Design/development costs: N/A		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	0	1	2	0	1
	Economic co-benefits				
	Revenue generating activities	Promotes economic inclusion		Avoided damages	
	0	0		0	
	Institutional co-benefits				
	Improve institutional capacity or efficiency	Enhances legislative environment			
2	0				

CA3: Develop and deliver a Flood Resilience Strategy					
Strategic objective(s)	SO10: Reduce flood risk in critical areas by 50% by 2040 SO17: Institutionalise climate resilience into all aspects of municipal operations and policies SO19: Improve public awareness of climate change				
Challenges	Priority environmental challenge		Related pressure		
	(PEC5) Management of increasing urban flash flooding risks		(Lu1) Competing land use priorities and pressures (Wc1) Hydrological changes due to climate change		
Description <i>What will be done?</i>	GAM will develop a Flood Resilience Strategy that supports the development of a coordinated city approach to risk intelligence, community resilience, land use planning, building controls, environmental management and disaster management across GAM. This will include conducting a flood risk analysis of Amman and implement planning policy that mitigates flood risk (e.g. restricting development of high-risk flood areas or introducing flood-mitigating requirements like floodgate installation etc.). This Strategy will link to W1 "Develop water conveyance and/or storage to reduce flood risk" which seeks to develop a flood conveyance and storage system to mitigate flood risk in Amman's hardest hit areas.				
Rationale <i>Why is it being proposed?</i>	The development and implementation of a Flood Resilience Strategy should help the city of Amman to adapt to climate change. Implementing this kind of strategy will help to lessen the impacts of flooding as well as the costs of damages caused by flooding events.				
Steps for implementation	1. Assign project manager and budget. 2. Conduct a procurement exercise to identify and award contract to external parties to develop the strategy 3. Identify key stakeholders and those who have the data required to support the strategy development. 4. Work with key stakeholders to fund and implement the Flood Resilience Strategy.				
Type of action	Plan/Strategy				
Plan for delivery	Action owner	Planning Directorate; Roads Directorate			
	Stakeholders	Ministry of Climate Change; GIS Directorate			
	Financing options	Municipal budget; international financial institutions; land value capture instruments			
	Revenue/savings opportunities	Implementing a Flood Resilience Strategy can increase the adaptive capacity of residents, lessening the burden on emergency services during flood periods and decreasing damages as planning regulations consider flood risk mitigation.			
	Timeline	2020 - 2022			
Impact measures	State indicators:				
	<ul style="list-style-type: none">Estimated economic damage from natural disastersPercentage of public infrastructure at riskPercentage of households at risk				
	Pressure indicators:				
	<ul style="list-style-type: none">Awareness and preparedness to natural disastersAnnual number of stormwater or sewerage overflows per 100 km of network lengthPercentage of dwellings damaged by the most intense flooding in the last 10 years				
Estimated cost	CapEx: N/A	OpEx: N/A	Design/development costs: € 27,000 – € 44,500		
Estimated co-benefits	Social co-benefits				
	Action will improve health	Improve safety and/or security	Enhance the public realm	Access to basic services	Social equity
	1	1	0	0	2
	Economic co-benefits				
	Revenue generating activities	Promotes economic inclusion		Avoided damages	
	0	0		1	
	Institutional co-benefits				
	Improve institutional capacity or efficiency		Enhances legislative environment		
	2		0		

6. Monitoring our Progress and Impact

This chapter outlines the key roles and responsibilities that have been put in place to implement the GCAP and track its progress (delivery and impact). These key roles include the Green City Coordinator, the GCAP Coordination Board and Green Champions, which were approved by the Steering Committee in July 2020. These roles will maintain accountability for the progress of the GCAP over the timelines set out in this document.

A transparent process has been established for monitoring, evaluating and reporting on the implementation of the GCAP. Supported by two Excel-based tools, the aims of this approach are to:

- Track implementation progress of GCAP actions through a Project Management Plan (PMP);
- Identify whether each implemented action is having the desired results and impacts, linking back to state and pressure indicators through the Impact Monitoring Plan (IMP);
- Facilitate learning about what is and what is not working, both in terms of the actions and the management and delivery structures in place within GAM; and
- Determine what adjustments need to be made during the GCAP implementation to maximise the potential for positive impact.

The results of GCAP monitoring can be complementary to other planning agendas and activities in GAM. Therefore, the Green City Coordinator will aim to align the monitoring and evaluation process with other city processes. Aligning the GCAP monitoring with other planned activities within GAM will help to streamline data collection with other stakeholder engagement initiatives, reducing duplication and improving efficiency.

Table 6.1. Roles and responsibilities for monitoring and report on GCAP actions

Role	Details
Green City Coordinator	The Green City Coordinator will be identified upon finalisation of the GCAP and will sit within the Amman Resilience Department of GAM. This role will coordinate the monitoring and reporting of the GCAP across departments, ensuring that the PMP and IMP are updated accordingly.
Departmental Green Champion	Each municipal department that has taken responsibility for the GCAP actions included in this document will appoint one Departmental Green Champion (DGC). The DGCs will be responsible for monitoring and reporting on the indicators linked to their respective actions. This information will be provided every quarter to the Green City Coordinator.

6.1 Monitoring Progress

Monitoring and evaluation will occur throughout the lifecycle of the GCAP. Monitoring will be conducted on a quarterly basis to allow changes and adjustments to occur before the next phase of an action begins. Evaluation will occur on an annual basis, to allow more substantial interventions to take place if an action is not progressing as intended. GAM will develop a Green City Coordination Board (GCCB) that will be responsible for implementing and monitoring actions. The GCCB will be comprised of Department Green Champions and will be headed by the Green City Coordinator, based in the Amman Resilience Department in GAM. Feedback on actions will occur at the annual Action Impact Board. In addition, bi-annual updates will be provided to the GCAP Coordination Board, who will be responsible for updating and amending the GCAP actions throughout the implementation phase based on the results of the monitoring feedback.

6.1.1 Project Management Plan

The PMP sets out all the GCAP actions broken down by strategic objective and target, including the body responsible for implementation and key milestones. The PMP also provides the sequence of action milestones over the life of the action.

Table 6.2. Excerpt of the PMP

Action	Strategic Objective	Actions	Type of action	Action Owner	2021	2022	2023	2024	2025	2026
Energy and Buildings										
EB1	S01	Invest in large grid-scale solar projects	Capital project	GAM in partnership with JEPCo						
EB2	S01, S02	Integrate LED systems into municipal street lighting	Capital project	GAM						
EB3	S01	Finance smart meters and batteries to promote grid stabilisation	Capital project	JEPCo with support and facilitation from GAM						
EB4	S02	Increase awareness of green building design	Plan/Strategy	GAM						
EB4.1	S02	Pilot municipal green building retrofit	Capital project	GAM						
EB4.2	S02	Establish green school buildings	Capital project	Ministry of Education / Ministry of Public Works						
EB5	S02	Develop solar-powered bus stands	Capital project	Directorate of Public Transportation						
EB6	S01	Expand the existing Landfill Gas Recovery (LFG) System	Capital project	Environmental and Solid Waste Directorate						

The Green City Coordinator, who sits within the Amman Resilience Department of GAM, will ultimately be responsible for overseeing the PMP, while the Departmental Green Champions will be responsible for updating the PMP for their respective actions, feeding this back to the Green City Coordinator on a quarterly basis through a regular meeting. The results of the monitoring will inform the planning of subsequent stages of each action as well as any required amendments to timeframes, resources and budget.

6.1.2 Impact Monitoring Plan

It is also critical to measure the extent to which GCAP actions are having the desired impact, along with any possible unintended consequences. The IMP is based on the Indicator Database used to inform the Technical Assessment and establishes a quantitative baseline for the state of environmental assets, as well as sectors that exert pressure on Amman's environment. The IMP sets out the baseline condition for each indicator against which annual evaluation will be undertaken. This will enable consistent assessment of the impact the various actions will have on the environmental state and sectoral pressures over the short to medium-term. The aim is to identify whether each implemented action is having the desired results and impacts, and if not, what interventions may be required to adjust or adapt the action.

Table 6.3. Excerpt of the IMP

Indicator Code	Indicators	Colour code	Figure	Units	Data Source / Contact Detail
2	Biochemical_Oxygen_Demand_BOD_in_rivers_and_lakes	YELLOW	No data	mg/L	Data given by WAJ laboratories
2.6	Ammonium_NH4_concentration_in_rivers_and_lakes	No Flag	No Data		
3	Percentage of water samples in a year that comply with national potable water quality standards	GREEN	100	%	

In addition to the PMP, the Green City Coordinator will also be responsible for overseeing the IMP, while each Departmental Green Champion will be responsible for monitoring the set of indicators that are linked to that department's actions (see sub-section 6.1.4 for information on improving baseline data). The Departmental Green Champions will update the IMP for their respective indicators on an annual basis and feed this back to the Green City Coordinator. As many actions will be impacting indicators across the objectives of several departments, Departmental Green Champions across all departments will need to work collaboratively to monitor annual impacts. Subsequently, the Green City Coordinator will provide an update to the Green City Coordination Board. This feedback can be provided through an annual Action Impact Meeting.

6.1.3 Sharing lessons learned

The Green City Coordinator will provide concise bi-annual updates to the Green City Coordination Board on the PMP and IMP. A more detailed Annual Progress Report will be produced and presented following the annual Action Impact Meeting, including a summary of:

- Action implementation status and any issues encountered;
- Recommendations for revisions to any GCAP actions;
- Change in a 'dashboard' of key state and pressure indicators;
- Potential new GCAP actions for consideration; and
- A public fact sheet on implementation progress will also be published on the GAM website. Press releases and case studies may also be produced to highlight specific success stories.

6.1.4 Improving baseline data

Successful monitoring and evaluation processes are grounded in good quality data. While completing the Indicators Database several limitations were encountered, including:

- Data for certain indicators was not available. Notable gaps include the number of contaminated sites, resilience of transport systems, consumption of heating and cooling energy in residential and non-residential buildings, and percentage of public infrastructure and households at risk to natural hazards.
- In some instances, data was derived by combining multiple sources, so it could be expressed in the prescribed units. This may limit the accuracy of the data and it will make it difficult to collate and monitor future data.
- Yearly average metrics do not capture seasonal variation that is important for indicators which are sensitive to seasonal changes, such as tourism season or weather, including energy consumption, road congestion, and waste generation.
- In some instances, the indicators requested by the PSR framework may not be the ideal measures of performance in Amman. Where feasible, alternative metrics have been sourced to supplement the metrics required under EBRD Green Cities.

Greater Amman Municipality can address these limitations in the following ways:

- Using the existing Indicator Database as a starting point, the GCC and DGCs will map out data sources. This will include addressing the gaps noted above and any others that the GCC and DGCs think are critical to ensure effective monitoring and evaluation.

- The GCC and DGCs will establish clear lines of communication around data collection and the data owners. This includes creating clear data collection schedules. Additionally, they will work with the data owners to identify ways in which the data gaps can be addressed.
- As part of the monitoring and reporting process, the GCC and DGCs will iterate on the IMP, identifying additional indicators that are relevant to better assess the impact of the respective actions.

Appendix A Baseline Conditions in Amman

This Appendix summarises the social, economic, environmental and governance context for Amman which provide the guiding baseline for the development and implementation of the GCAP. It is based on available data, interviews and validation of the key findings with stakeholders. This is a synopsis of a more detailed analysis undertaken in the Political Framework Report and Technical Assessment Report, which helped to identify and inform the Green City Actions described in Chapter 5.

A.1 Social, economic and institutional context

Amman occupies a strategic social and economic position within Jordan and the broader region. Amman comprises 43% of Jordan's population, making it an economic hub. As a result, Amman's population has grown dramatically in the past decades, with its population doubling in the last ten years alone. This growth is largely due to economic migration and the influx of refugees resulting from conflicts in neighbouring countries. At present, almost one third of the Kingdom's population (2.9 million) are non-Jordanians, including 670,238 registered Syrian refugees, of which 17,440 are within the Amman Governorate¹⁸ although estimates indicate the actual number of Syrian refugees is much higher.

Jordan is a middle-income country with an estimated GDP of USD 5,029 per capita. Amman's unemployment rate is the lowest in Jordan, and the economic opportunities afforded to residents has driven much of the economic migration in the past decade. The key economic sectors in Jordan are agriculture, mining, services, tourism and industry.

The city of Amman has extensive road networks, with many of the country's highways converging on the capital. As of 2017, Amman's roads consisted of approximately 277km of highways, 271km of secondary roads, and 564 km of rural roads. Railway transportation in Jordan is managed by the Hijazi Railway and the Aqaba Railway Corporation. There are approximately 452km of rail lines in Jordan. The railway is not currently an effective mode of transport, but Jordan is aiming to expand its railway system in order to integrate with regional railway networks.

With regards to energy, around 96% of the country's energy demand is met through oil and gas imported from neighbouring countries. The electrical system in Jordan includes generating plants, main substations and transmission networks of high voltage 132 and 400 kV that connect these stations with the load centres in various regions of Jordan, in addition to the electrical interconnection lines 400 connected with Egypt and Syria.

The service sector in Jordan accounts for approximately 70% of the GDP. However, the construction industry is an increasingly large contributor to economic productivity due to an increased demand for housing and offices by foreign enterprises. The mining sector is an essential component of the Jordanian economy with 32 of Jordan's 94 mining and quarry facilities being registered or based in Amman. Most industries in Amman are in designated zones, but small industries and craft shops are allowed in residential areas.

Tourism is another key industry. Following the onset of the 'Arab Spring,' there was a marked downturn in tourism to the region. However, Jordan's continued political and economic stability led to a slow increase of international visitors, especially from East Asia. During 2017, the Jordan Tourism Board supported plans for stimulating charter and low-cost flights, including supporting tickets prices and subsidising visas through the Jordan Pass.

A.2 State of and key pressures on environmental conditions in Amman

This section describes the baseline conditions of key environmental indicators in Amman. The indicators were developed by the EBRD in partnership with ICLEI and the assessment is based on the EBRD's Pressure-State-Response Framework. The State and Pressure indicators were collected from relevant authorities within national and municipal governments.

State and Pressure indicators throughout the following sections will be presented with their 'latest value,' which represents the most recently available data. This data is colour-coded according to 'traffic light screening' to reflect high (green), medium

¹⁸ UNHCR. 2019. 'Total Persons of Concern.' Available from: <https://data2.unhcr.org/en/situations/syria/location/36> [Accessed 19 January 2019].

(yellow), or low (red) performance compared to pre-defined benchmarks outlined in the GCAP methodology. These pre-defined benchmarks use international standards, EU directives and national laws where applicable (EBRD, 2017).

The data collection process began with desk-based research to gain a broad understanding of the baseline situation and gather as much indicator data as possible from available secondary sources. Subsequently and as part of the Political Framework, relevant stakeholders were identified who would likely have access to necessary datasets that were not publicly available. Formal letters requesting data were sent to the identified stakeholders on 01.04.2019 and 21.04.2019. Table A.1. presents a timeline of when data was received from the contacted stakeholders.

A. 1. Timeline of data collection

#	Date	Entity
1	10.02.2018	WAJ
2	27.02.2019	Miyahuna
3	12.03.2019	GAM – Nisreen Dauod
4	27.03.2019	GAM - Transportation Department
5	28.03.2019	GAM - Urban Development Department
6	04.04.2019	NEPCO, MoEnv and EMRC
7	07.04.2019	Miyahuna, RSCN, MoT, (JEPCO - closed)
8	08.04.2019	JEPCO
9	09.04.2019	MEMR and EMRC
10	14.04.2019	GAM - progress meeting
11	15.04.2019	GAM - transportation department and environmental department representative
12	17.04.2019	GAM - buildings and renewable energy department
13	18.04.2019	GAM - GIS and urban planning development
14	23.04.2019	GAM - JEPCO, WAJ AND MWI
15	25.04.2019	DVLD and GAM - GIS department
16	30.04.2019	Progress Meeting – JEPCO
17	14.05.2019	Meeting with JEPCO

Air Quality

Table A.2. Air quality - available indicator data

Available data	
Indicator (in $\mu\text{g}/\text{m}^3$)	Latest value
Average annual concentration of $\text{PM}_{2.5}$	50
Average annual concentration of PM_{10}	74.32 (average)
Average annual concentration of SO_2	24.75 (average)
Average daily concentration of NO_x	35.63 (average)

In 2000, it was estimated that approximately 600 people per year die prematurely from urban air pollution in Jordan.¹⁹ Increasing population and road congestion likely mean that this number is now higher. The sectors with the greatest contribution to Amman's air quality challenges are transport and, to a lesser degree, energy production and building performance. Approximately 50-90% of urban air pollution results from road traffic and fossil fuel heating.

The Environmental Monitoring and Assessment Directorate under the Ministry of Environment coordinates a national network of 30 ambient air quality monitoring stations in Jordan including seven sites in Amman. The electronic monitoring stations record levels of PM₁₀, NO₂, CO, O₃, and SO₂.

PM₁₀

PM₁₀ can cause several problems, especially for people with respiratory illnesses such as asthma and bronchitis. Particles can also affect the immune system, thus reducing the body's ability to resist and fight infection²⁰.

PM₁₀ concentrations are also associated with fossil fuel vehicles and industrial processes. Furthermore, the Ministry of Environment found that high winds, coupled with soil erosion/desertification prevalent around Amman, exacerbate PM₁₀ concentrations across all the monitoring stations². Although this increase is within the daily and annual limits set out in the Jordanian Technical Base 1140/2006 for ambient air quality, they do not meet the benchmarks provided by EBRD through the PSR framework.

The results of the monitoring also showed that there were the hourly and daily concentrations of PM₁₀ in excess of the Jordanian Standard 1140/2006 in most locations with the highest daily readings of PM₁₀ occurring during the peak period of traffic (between 8-9 am and 7-8 pm). The annual average particulate concentrations were, however, within the limits of Jordanian standards for most of the year.

PM_{2.5}

The WHO has estimated that PM_{2.5} levels across Jordan are considerably higher than their guideline value of 10 µg/m³ and above the international indicator benchmarks. These are likely to be even higher in Amman due to the high concentration of private fossil fuel combustion vehicles.

SO₂

In general, SO₂ affects respiratory system, functions of lungs, irritate eyes, causes coughing, mucus secretion, aggravates asthma, chronic bronchitis, makes people more prone to respiratory tract infections. SO₂ can also cause acid rain (sulphur dioxide combined with water produces sulphuric acid), which can cause forest dieback, acidification of waterways to the detriment of aquatic life, and corrosion of building materials and paints. These impacts are expected to occur in highly congested areas.

SO₂ measurements at three of the four monitoring stations for which data was available exceeded the limits to achieve 'good' quality against international standards. The only station that fell within the limits of high performance was at King Hussein Park, which is likely to be as it is the only station near urban green space.

NO_x

NO_x contributes to the formation of smog and acid rain and reacts with volatile organic compounds to form ground-level ozone (O₃), which is harmful to human lung function. Further, NO_x substantially contributes to the greenhouse warming effect, and emissions are thereby a driver of climate change.

NO_x concentrations are 35.64 µg/m³ when averaged across all monitoring stations. Although this is within the acceptable limits of international standards, three of the seven monitoring station measurements recorded 'medium' performance of NO_x concentrations compared to international standards. This indicates that localised NO_x pollution is a challenge and may have implications for populations in the vicinity of these areas. The most common source of NO_x emissions is from diesel engines, further evidencing that vehicles and heavy congestion are a major source of air pollution in Amman.

Other considerations

¹⁹ Myriam Ababsa 2013. Atlas of Jordan. Beirut.

²⁰ Kingdom of Jordan Annual Report to Monitor Air Quality of the Ocean (Amman, Irbid, Zarqa) From April 2016 to April 2017. Available online at: <http://moenv.gov.jo/AR/PDFs/%D9%85%D9%84%D9%81%D8%A7%D8%AA%20%D9%85%D8%AF%D9%8A%D8%B1%D9%8A%D8%A9%20%D8%A7%D9%84%D8%B1%D8%B5%D8%AF/Arabic%20REPORT.pdf> [Accessed 2 May 2019]

It is important to note, however, that air quality in the immediate vicinity of the monitoring stations does not necessarily give a good indication of overall air quality across the city. Also, the hilly topography of the city means that pollutants can become 'trapped' between the hills. Air pollution improvements are essential for improving the health of Amman's residents. Similarly, energy use for local heating may contribute to poor air quality outcomes, particularly for those households who are not connected to a gas line and, thus, heat their homes through the combustion of fossil fuels (diesel, gas, kerosene and LPG) and in the urban periphery, charcoal and wood are frequently used for cooking, resulting in high particulate pollution. Although this happens all over Amman, concentrations are likely to be higher within the refugee camps of Amman New Camp, Jabal El-Hussein Camp, Marka Camp. In addition to solid fuel, anecdotal evidence notes that LPG is a common source of fuel for heating and cooking amongst refugees. The following challenges for air quality in Amman are summarised in the table below:

Table A.3. Air Quality Challenges in Amman

Sector	Challenge	Description
Transport	Pollution from private and especially ageing vehicles	Heavy reliance on ageing private vehicles, poor driving behaviours and illegal parking contribute to high congestion levels. The vehicle fleet has an average age over 18 years and there is a high proportion of diesel buses and cars which increase emissions.
	Lack of reliable and formal public transport	A lack of prioritisation of public transport has resulted in unreliable networks with limited mapping or understanding of affordability and poor pedestrian and cycling paths creating a poor pedestrian and cycle environment.
	Non-existing / Outdated data	Neither the Ministry of Environment nor any of GAM's environmental departments have monitoring of PM _{2.5} . In order to understand the correlation between the fossil-fuel emissions through transportation, PM _{2.5} data needs to be collected and assessed. Transportation data mostly stems from studies undertaken in 2010, therefore more accurate and up-to-date information is required to understand the emission-levels of different transportation systems.
	Limited incentives for electric/hybrid vehicles	Tax restrictions on importing electric (by a 25% customs tax on electric cars imposed in January 2019) and hybrid cars and restricted charging infrastructure limit the opportunity of electric and hybrid cars.
Energy	Thermal Power Plant pollutants	There is limited energy infrastructure, however winter winds may blow emissions from two thermal power plants towards the city.
	Energy regulations	Energy performance is not a formal requirement of building regulations and only featured as voluntary part of the new green building guidelines.
Buildings	Domestic burning of fossil fuels	Burning fossil fuels for heating (diesel, kerosene and LPG) and cooling buildings and the use of solid fuel for warming and cooking in households contributes to emissions. The most recent available figures from the 2008 GHG emission inventory estimated that 38kt of kerosene and 158kt of diesel (25% of total) were burnt per annum. There is a need to update data on indoor heating/cooling emissions to provide a conclusive trend analysis.
	Poor energy performance of buildings	Residential, commercial and small/medium industries have the highest electricity consumption; however, data is limited so it is difficult to determine energy performance and building footprint.
	Lack of incentives for implementing Green Building guidelines	Uptake of the Green Building Guideline and Rating System in new buildings is poor, due to a lack of incentives and enforcement of more efficient energy consumptions within buildings.
Land Use	Rapid and unplanned urban expansion	Unplanned urban expansion has led to an increase of journey times and thus to an increase of emissions.
	Desertification	Densification results in high levels of particulate matter being brought to the city through regular sand storms.
	Topography	The topography of the city exacerbates challenges for managing air pollution.

Sector	Challenge	Description
	Limited greenspace	Urban greening can absorb pollutants and reduce air quality impacts on resident health.

The following initiatives are currently in place to address air quality challenges:

Leaded fuel was banned in 2009

When people want to renew their car licences annually, a check-up is done at the DVLD, if the car is a high polluting or too old, an action needs to be taken by either paying fine or fixing the issue. Moreover, the Environmental police check up the vehicle exhausts in streets to check their status.

Extension and improvement of public transport is planned and supported, including the Bus Rapid Transit project.

Public and non-motorised transport is promoted through social media and street signs.

Traffic demand is managed through smart technologies, including the Sydney Coordinated Adaptive Traffic System (SCATS).

Water quality and availability

Table A.4. Water quality and availability - available indicator data

Available data	
Indicator	Latest value
Percentage of water samples in a year that comply with national potable water quality	99.7%
Water use	No data
Reuse from WWTP	56%

Jordan's water cycle is predominantly characterised by scarcity punctuated by periods of flooding. There are no freshwater bodies in or around Amman and as such there is no information relating to the quality of water bodies. In response to the scarcity, Jordan depends largely on groundwater resources, surface storage, and wastewater reuse. All except wastewater reuse comprise Amman's water supply; wastewater reuse is only for agriculture purposes. Around 97% of Amman's population is connected to the potable water network with regular testing to ensure safe drinking water. Population growth, land use, consumption by the energy and industrial sector, and pollution from waste are the main pressures on water quality and availability. It is important to note that Amman's water supply is mostly sourced from water bodies outside of the municipal bounds. Therefore, water availability and pressures across Jordan have bearing on Amman's water quality and availability. Climate change exacerbate the issues; therefore, Jordan has implemented strict water demand management principles.

Despite continued expansion of the water and wastewater networks, non-revenue water losses are still higher than international standards and reducing these would contribute to greater water efficiency. Illegal connections are a challenge for Amman. In 2017, there were 2919 illegal uses detected, amounting to 2,914,420 m³ of non-revenue water loss.

Industry consumes a relatively low proportion of Jordan's available water supply at 4%. While there was no data available on Amman-specific industrial water consumption, Amman's increasing industrial activity will see a corresponding increase in industrial water consumption. Currently, treated wastewater is frequently used in industrial activities in order to efficiently manage Jordan's limited water resources.

Additionally, while no data was available on quality of industrial wastewater effluent, industrial water discharge could have implications for water exploitation and the health of Amman's water resources, specifically the Amman Zarqa Basin. The chemical manufacturing and cosmetics industries are the fastest growing industries in the city, and their wastewater discharge may detrimentally impact soil quality in and around the natural wadis.

In Jordan, only 5% of land receives enough rainfall to support cultivation. As such irrigation for agriculture is currently the largest use of water nationally. Although agricultural areas make up only a small proportion of GAM's area, the high use outside of the city has an impact on water availability in the city. Additionally, Amman faces challenges from the illegal drilling of wells and unlawful water extraction for agricultural uses.

Safe sanitation is vital for improved human health, disease and pollution prevention, Jordan is keen to apply the global best practices in wastewater treatment, management and reuse. The proportion of Amman's population with safe sanitation sits at 79.4%. The following challenges for water quality in Amman are summarised in the table below:

Table A.5. Water Quality Challenges in Amman

Sector	Challenge	Description
Transport	Diffusing urban pollution (limited impact)	Heavy metals from fuel residue and particulates from exhaust and tyre wear on transport routes are washed into sensitive areas during rainfall events.
Buildings	Lack of water efficiency incentive	Few voluntary standards and no legally enforceable requirements for water efficiency measures / planning exist.
Energy	Nuclear energy expansion	Jordan Atomic Energy Commission is pursuing a nuclear strategy, which could contribute to water stress through potentially water-intensive operations.
	Expansion of desalination projects	The Ministry of Water and Irrigation has invested heavily in desalination of sea water to meet the needs of Jordan's growing population and to combat its existing water stress. While desalination is a necessity, consideration should be given to ensure adequate support is provided to energy supply.
Water cycle management	Water scarcity	The limited renewable water sources in Jordan are unsustainably used.
	High levels of network losses	Network losses account for 30% of the supplied water, however upgrading the network is expensive and likely to cause severe road disruption.
	Low water consumption	Water consumption is lower than recommended levels, with some people consuming significantly less depending on socio-economics.
	Groundwater protection	Several areas in and around Amman are classified as high risk to groundwater contamination.
	Wastewater	Further connections to the wastewater networks are necessary. Despite high levels of wastewater reuse, additional reuse is likely to be needed.
Land Use	Agricultural over abstraction	Unsustainable groundwater abstraction is exacerbated by illegal wells and informal abstraction.
	Urban expansion	Rapid urban expansion and population increase puts pressure on the existing network and water resources, and illegal connections are challenging to police.

- The following initiatives are currently in place to address water quality and availability challenges:
- Metering and billing for water use and wastewater is regulated.
- Amman's water supplier, Miyahuna, spreads awareness about water efficiency to users and is conducting some pilot experiments regarding encouraging water saving and reuse through awareness campaigns.
- A water loss campaign is being conducted with financial support from KfW and USAID and the rehabilitation of water supply is in progress for selected water zones in Amman.
- Water pre-treatment is enhanced through Miyahuna's surface water and groundwater plans and investment.
- To combat flash flooding (as discussed in Section 0), the 2025 Strategy for the Water Sector proposes developing drainage facilities
- In order to combat diffuse urban pollution, high-polluting vehicles are regulated through DVLD check-ups upon annual car licence renewal and environmental police checks on vehicle exhausts in streets.
- Extension and improvement of public transport is planned and supported, including the Bus Rapid Transit project.

Soil quality

Table A.6. Soil quality - available indicator data

Available data	
Indicator	Latest value
Conc. of cadmium in soil	2.18
Conc. of zinc in soil	137.8
Conc. of lead in soil	270.5

Despite a significant lack of data, soil quality in Amman is generally considered to be good. Where tested, concentrations of cadmium, zinc, and lead are within the limits of the 'good' international standard. However, high usage of fossil-fuel vehicles will contribute to higher concentrations of cadmium and lead from exhaust emissions, and an increased zinc deposits from worn tires. Although the overarching indicators suggest that soil contamination is not a major issue in Amman, there are several site-specific soil quality issues, such as the 'Pepsi Pond' in Russeifa, which collects flood water, waste, and debris. Similarly, soil in and around the pond may be contaminated through runoff. Additionally, there is surplus storage of old acid battery waste in Marka. Leaching of metals (lithium, lead, etc.) and acid from batteries can detrimentally impact soil quality. Monitoring of sites with known hazards would provide more actionable data.

Amman has semi-arid climate and associated soils. While semi-arid climates can support agriculture through irrigation, the lack of canopy cover means that they can have fewer nutrients, looser soil structure due to their sandier characteristics and, thus, are more prone to erosion. Soil salinization and desertification is occurring to some extent within Amman's agricultural areas to the Southwest (SW) of the city centre.

A 2007 study determined that vehicular traffic was the most important source of metal accumulation in the streets and soil of Amman. Chemicals used for preservation of the railroad – including carcinogenic polycyclic aromatic hydrocarbons and heavy metals - can enter the surrounding soil. This would affect soil around Amman's railway, which runs parallel to Al-Jazirah St and King Abdullah I St in the centre of the city.

Most industries in Amman are located in designated industrial zones, but many small industries and crafts are situated within residential areas as a result of unplanned decision-making. Most of these SMEs dispose waste and effluents into municipal waste collection systems, reportedly including illegal hazardous waste which is collected by GAM and transported it to Al Ghabawi landfill. Amman's increasing industry activity will also exert pressure on soil quality. Notably, the chemical industries and cosmetics sectors share of exports increased from 7% to 23.1%. Both these industries can have negative impacts on soil quality through wastewater effluent discharge.

Soil management is inexorably linked with water management. If soil is contaminated, contaminated runoff can enter water bodies, pollute ecosystems and pose a threat to human health. Conversely, if water is contaminated, it can contaminate soils as contaminants move through the hydrological cycle. In Amman, 100% of wastewater transported through the sewage network is treated to national standards; however, only 79.4% of Amanis have access to piped wastewater networks. While anecdotal evidence suggests that those who do not have access to piped sewerage have access to septic tanks instead, it is also possible that some human waste is openly disposed – contaminating soil and water. The increase in refugees in Amman may also contribute to illegal dumping as refugee camps may not have as frequent collection of MSW.

Soil quality also has implications for water cycle management. Soil types differ between Northwest (NW) Amman and Southeast (SE) Amman. Notably, development is most intensely occurring in the NW. Soils in the NW areas require less water to maintain its structure and the temperature of the area. In the SE, temperature and evaporation rates are higher, and there is poor recharge of groundwater reserves as a result. Over time, this effect may accelerate soil degradation and desertification rates, leading to degradation of agricultural land in the eastern region of GAM. Climate change will intensify this process by increasing evaporation (from higher temperatures) and decreasing precipitation.

Rapid changes in land use and intense agricultural activity can drive desertification. Desertification is a major concern across Jordan – threatening 90% of land in Jordan - and will increase in severity with climate change. Land use change (LUC) drives desertification by deteriorating the physical, chemical, and/or biological properties of soil.

The removal of the earth's surface for highway construction or airport development leads to the soil degradation, furthering erosive processes. Between 2009 and 2010 Amman constructed over 199,000 km of new rural roads. Since 2010, construction of rural roads has levelled out with a 6% increase of new roads between 2010 and 2016. Amman's rapid construction and conversion of previously rural or agricultural land to built-up land has additionally pressured soil quality, particularly to the west of the city. Rapid construction can decrease the stability of soil, removes and disturbs topsoil – which is the most biologically active component of soil. Construction can also contaminate soil through leakage of machinery.

Amman's construction sector is growing due to an increased demand for housing and offices by foreign enterprises. However, Amman's rapid rate of construction growth has generated 2.6 million m³/year of construction waste. It is the municipality's responsibility to regulate, monitor, and enforce construction and demolition waste (Municipalities Law No. 13/2011). Amman regulates this waste through City of Amman No. 67/1979 zoning regulation. It appears that compliance is high for these statutes, and ensuring continued compliance is crucial to maintaining soil health. The following challenges for soil quality in Amman are summarised in the table below:

Table A.7. Soil Quality Challenges in Amman

Sector	Challenge	Description
General	Limited data	There is limited data to characterise soil quality issues. A better understanding of the problems is needed to establish targeted policy and actions.
Transport	Rapid road construction	Urbanisation leads to erosion from construction and increased vehicle numbers.
	Dependence on motor vehicles	High numbers of private vehicles lead to an increased number of parking lots and maintenance garages causing greater risk of oil and chemicals contaminating the soil.
	Lack of incentives for energy-efficient vehicles	The high number of private gasoline vehicles on the roads leads to diffuse urban pollution running into the soil surrounding the main roads.
Industries	Lack of data around disposal practices	Chemical and cosmetic industries are currently the most economically productive in Amman, and therefore likely have significant operational impacts on their surrounding environment.
Energy	Thermal power plant energy generation	Energy production accounts for a significant margin of cadmium, mercury, and lead emissions, which impact soil quality through wet deposition.
Water cycle management	Hydrological changes due to climate change	The increase in evaporation and the decrease in rainfall expected under future climate scenarios will likely accelerate desertification and erosion.
	Unsustainable agricultural practices	The impacts of climate change on existing agricultural practices are not well understood.
Solid waste	Illegal dumping	Environmental-friendly practices are not engrained in everyday life behaviours; therefore, littering is common.
	Increasing per capita generation of solid waste	Currently landfills have 16 more years of their lifecycle; however, the high amount of waste production must be addressed.
	Increasing construction waste	Amman's expansions have increased consumption and waste generation, therefore proper disposal and recycling of construction and demolition waste is needed.
	Food waste disposal practices	There is no formal composting of food waste in Amman.
Land Use	Controlled planning	Limiting master plans and zoning in Amman's agricultural areas can contribute to soil protection. However, consideration must be given to the soil erosion and desertification impacts of rapidly growing built-up areas.
	Lack of climate-smart greening	Climate-smart options for revegetation and agriculture are necessary to mitigate and adapt to climate change impacts on soils.
	Urban expansion	Construction puts pressure on soil quality when waste is not disposed adequately. Unsustainable site practices lead to increased erosion and dust.

There is little specific policy focusing on improving soil quality. However, relevant programmes or policies that relate to soil quality include:

- Overcapacity issues in landfills causing illegal waste dumping and soil contamination are tackled through plans and investments.
- High-polluting vehicles are regulated through DVLD check-ups upon annual car licence renewal; however, energy efficient vehicles are no longer incentivised since the taxes/customs increased.
- Extension and improvement of public transport is planned and supported, including the Bus Rapid Transit project and public transport studies.
- City expansions are regulated through zoning, regulations, and planning strategies, as well as applying the Metropolitan Growth Plan (MGP) policies from the Comprehensive Planning Department.
- Some communities in Amman have been working to combat desertification. These include grassroots organisations like Greening the Camps, which aims to spread rooftop gardens in refugee camps. Greening the Camps pilot project began on Amman's social-cultural community centre, Jadal.

Green space and biodiversity

Table A.8. Green space and biodiversity - available indicator data

Available data	
Indicator	Latest value
Open green space area ratio per 100,000 inhabitants	0.73
Share of green space areas within urban limits	3.67
Richness of bird species	12

Green space availability in Amman is significantly below the international benchmark of at least 10 m² of green space per capita. While there are many parks in Amman some parks feature no green space at all and are almost entirely paved. Green space is also disproportionately distributed in central Amman and around cultural heritage sites, with decreasing green space in the urban periphery.

There was no core indicator data available on Amman's biodiversity. While Amman itself has no designated Important Bird Areas (IBAs), Jordan has 18 IBAs which are all experiencing at least one serious, long-term threat. It is likely that Amman's avifauna may also be experiencing pressures from population growth and development, thereby impacting species richness and abundance. Amman's lack of green space detrimentally impacts biodiversity due to the lack of habitat and limited ecological connectivity.

Land use is the major driver of lack of green spaces and detrimental impacts on biodiversity. Currently, land use to accommodate rapid urbanisation and population growth has taken precedence over the protection and promotion of existing green space, and there are no legally-binding requirements in development policy relating to the inclusion of green space in new or existing developments. Improving spatial planning has been identified as a high priority of GAM. One option available to GAM is that any new master planning and zoning must stay away from agricultural land and green areas and expand toward the east of Amman. However, there is a high number of vacant plots in Amman which contribute to informal green areas.

Transport is a determining factor for biodiversity. Roads can cause significant fragmentation of habitats, reducing the opportunities for species dispersal, and the viability of smaller more sensitive populations of species. This rapid rate of road construction is likely to have had an adverse effect on habitat availability and abundance of local species, through habitat fragmentation, pollution and population decline. The strong preference for road transport in Amman has increased the consumption for space to be used for roads or parking, which impacts the space in Amman that could be used as an open green space.

Improper disposal of hazardous waste in the landfill is highly problematic and has implications for biodiversity, particularly because Amman's top-two revenue generating industries are chemicals and cosmetics. Chemical pollution can affect biodiversity by impacting habitats, changing biophysical characteristics of the ecosystem, and/or disrupting the genetics of an individual.

Tourism can drive reduction in green space as more land is devoting to serving the tourist economy, from building hotels to parking space to accommodate growing numbers of visitors. Additionally, tourism can detrimentally impact biodiversity by contributing to changes in ecosystem conditions (e.g. through trampling off-piste), introducing exotic species, and broadly contributing to climate change. Amman's green and open space is disproportionately located in the historic and tourist-heavy districts, which puts the biodiversity dependent on this green space at higher risk due to heavy footfall and tourist activity.

Water cycle management exerts greater pressure on biodiversity through water consumption. Jordan is one of the most water-scarce countries in the world. The increasing population in Jordan has increased water-stress, taking higher proportions of water for anthropogenic use and less for ecosystems. The following challenges for green space and biodiversity in Amman are summarised in the table below:

Table A.9. Green Space Challenges in Amman

Sector	Challenge	Description
General	Lack of reliable biodiversity data	There is a lack of reliable biodiversity data, therefore monitoring of trigger species listed as biodiversity indicators is needed.
	Triple bottom line	Social, economic and environmental needs and requirements need to be balanced to improved quality of life.
Transport	Habitat fragmentation	Rapid construction in response to urbanisation fragments habitats and converts green space to grey infrastructure.
Buildings	Lack of green space regulation within new developments	Increasing green areas percentage within building spaces or as part of new developments is a necessity to support connectivity of habitats and provide physical and mental benefits to residents.
Industry	Lack of data on industrial environmental standards and compliance	It is unclear how industries are performing in Amman, resulting in a gap of knowledge on the extent to which they are impacting biodiversity.
Energy	Commitments to increasing renewable energy and implications for green space	Increasing renewable energy is a priority for Amman, however, renewable energy developments should take into consideration environmental impacts.
Solid Waste	Increasing waste generation	Currently landfills have 16 more years of their lifecycle; however, the high amounts of waste production must be addressed.
Land Use	Competing land use priorities	Development is occurring at the expense of green space and biodiversity, and there is a trend toward urban sprawl in Amman.
	Urban development pressures	Lack of open green spaces within the city (e.g. parks) and greenfield areas surrounding the city that provide habitat for local flora and fauna species.
	Rapid expansion outpacing planned development	Improving spatial planning is identified as a high priority in Amman.

- The following initiatives are currently in place to address green space and biodiversity challenges in Amman:
- Fuel standards and vehicle inspections are enforced, which ideally improve or maintain ecosystem health.
- Amman is developing a BRT network to decrease dependency on private motor vehicles, thereby reducing pollutants that may be impacting biodiversity.
- Al Ghabawi landfill was recently expanded with support from EBRD to manage increasing waste generation.
- The percentage of eco-tourism in Jordan is on the rise due to the existence of Protected Areas and other environmental initiatives such as: "Blue Flag Initiative" and "Green Key" which develop and spread awareness about the concept of environment and sustainability.

- GIZ Green Infrastructure Project - This project aims to increase and enhance green infrastructure in Amman and employs vulnerable populations to develop these spaces. Given that one of the Priority Environmental Challenges identified is Amman's low ratio of green space, the GCAP can build on this GIZ project and ensure that there is no redundancy in locations of functional green spaces proposed or implemented via GIZ or the GCAP.

Greenhouse gas emissions

Table A.10. GHG emissions - available data

Available data	
Indicator	Latest value
Annual CO ₂ equivalent emissions per capita	2.19 (2014) 2.43 (2019 projected)
Annual CO ₂ emissions per unit of GDP	493 tonne per m\$

The World Bank calculated 2014 the baseline GHG emissions to be 7.43m tonnes CO₂e or 2.19 tonnes per capita and projections show that this level is steadily growing to 2.43 tonnes per capita for 2019. This increase is projected to continue to grow to 2040 and beyond unless significant investment is put into decarbonisation efforts.

Over half of all GHG emissions are a product of energy generation at and most of these emissions are related to energy demand within residential properties and commercial buildings. The high carbon factors associated with generating electricity mean that most of the city's emissions are associated with meeting residential and commercial demands. Furthermore, the use of gas, kerosene and diesel for property heating in winter, exacerbated by poor building energy efficiency, increases building related emissions. The data shows that targeted approaches to reduce energy consumption should be in residential, commercial and small/medium industries to ensure to make the biggest impact. Only a small amount of emissions relates to industrial processes, partly explaining why Amman's per capita emissions are lower than national emissions.

Around 1/3 of GHG emissions are associated with ground transportation. Firstly, there are a high percentage of private vehicles as the primary mode of transport (68%) due in part to a lack of safe and reliable public and alternative transport options. Secondly, most vehicles (c.90%) are combustion engine vehicles (CEVs) – with 22% of those being diesel engines. Thirdly, private vehicles have an average age of 18 years in Amman, indicating that they are inefficient and result in higher emissions than younger vehicles. Finally, the high level of private vehicles contributes to road congestion – evident through the slow travel speeds at peak times. This means cars are idling on the road for longer periods of time and emitting GHG as a result. The uptake of hybrid and electric vehicle has been increasing, with hybrid vehicles far outpacing electric vehicles (EVs). However, the recently introduced customs taxes on hybrid and electric vehicle import will depress uptake of these vehicles for most people unless other incentives are introduced. Also, the lack of public and alternative transport options and their poor reliability compounds the preference towards private vehicles. Anecdotal evidence notes that Amman is not a pedestrian-friendly city – with obstructions and poor maintenance common on sidewalks.

The GHG gases emitted from the landfill are approximately 50% methane, a potent greenhouse gas, added to about 45% of carbon dioxide with 5% of other gases.

There is little green infrastructure in Amman, with a relatively low number of open spaces and limited space for vegetation. This is compounded by the arid and semi-arid climate which restricts plant growth. As such, the role of natural carbon sinks in and around the city is limited.

Agricultural practices and soil disruption around the city had negative impacts on land conservation. The use of agricultural and green land for urban expansion (west of Amman) has damaged the chances of green land conservation. Additionally, it is likely that methane was released as a result of soil disturbance.

The following challenges for GHG emissions in Amman are summarised in the table below:

Table A.11. GHG Emission Challenges in Amman

Sector	Challenge	Description
Transport	Pollution from private vehicles	Heavy reliance on private vehicles, poor driving behaviours and illegal parking contribute to high congestion levels. The vehicle fleet has an average age over 18 years and there is a high proportion of diesel buses and cars which increase emissions.
	Lack of reliable and formal public transport	A lack of prioritisation of public transport has resulted in unreliable networks with limited mapping or understanding of affordability and poor pedestrian and cycling paths creating a poor pedestrian and cycle environment.
	Outdated data	Transportation data mostly stems from studies undertaken in 2010, therefore more accurate and up-to-date information is required.
	Limited incentives for electric/hybrid vehicles	Tax restrictions on importing electric and hybrid cars and restricted charging infrastructure limit the opportunity of electric and hybrid cars.
Buildings	Absence of building efficiency standards	Building emissions result from high rates of energy consumption and lack of awareness about efficient energy use.
	Lack of enforcement of Green Building Codes	The mandatory building codes and the voluntary green building guidelines have low level of uptake in Amman due to enforcement issues.
Energy	Fossil Fuel dominated energy production	Improving energy efficiency and security will reduce energy consumption and lead to less GHG production.
	Renewable energy resources	There is currently a lack of incentives for renewable energy resource
Water	Reducing non-revenue water losses	Water network lose about 50% drinking water, which not only has a financial cost, but also wastes energy and produces more emissions.
	Quality of wastewater for agriculture	It is illegal to use treated wastewater for farmed crops due to the quality. Agricultural practices use a significant amount of water, and water is scarce in, therefore effective re-use of wastewater for agricultural irrigation water treatment should be promoted.
Land Use	Lack of parks/green open spaces	Green spaces in the city are limited, however replacement of buildings or parking spaces with open space will directly reduce emissions and have indirect positive attributes such as encouraging walking.

- The following initiatives are currently in place to address greenhouse gas emission challenges in Amman:
- Amman is currently in the process of finalising a Climate Action Plan setting a vision for near zero carbon emissions by 2050. Additionally, GAM has commitments to be a near-zero city (0.01 tCO₂e/person) with a 40 percent reduction in GHG emissions by 2030.
- Jordan submitted its Intended National Determined Contributions (INDCs) under the Paris Agreement September 2015, pledged a reduction of 14% of GHG emissions in Jordan compared to business as usual scenarios by 2030.
- High-polluting vehicles are regulated through DVLD check-ups upon annual car licence renewal; however, energy efficient vehicles are no longer incentivised since the taxes/customs increased. Extension and improvement of public transport is planned and supported, including the Bus Rapid Transit project and public transport studies. It has been predicted that this new 25km route will carry 200,000 people a day, reducing ground transport related emissions by 95,000 tonnes per annum in 2021 and 138,000 tonnes by 2040. BRT is expected to reduce emissions.
- Public and non-motorised-transport is promoted through social media and street signs.
- Traffic demand is managed through smart technologies, including the Sydney Coordinated Adaptive Traffic System (SCATS).
- Green building is promoted through standards and fiscal Incentives. Voluntary green building guidelines were published in 2014 by the Jordan Green Buildings Council and are based on Leadership in Energy and Environmental Design (LEED) certification. Incentives are given by GAM through provision of additional floor area density if the building.
- Mosques, private houses and some commercial companies currently invest in energy efficient buildings.

- JEPCO is responsible for metering and billing for personal energy use.
- The government set levels of acceptable pollutant gas emissions from industry and vehicles, and two types of unleaded petrol were introduced, significantly limiting lead pollution.
- The Second National Energy Efficiency Action Plan commits to 20% improvement in energy efficiency by 2020 which will have a knock-on positive impact on the reduction of emissions caused by commercial and residential electricity use.
- A Biogas Company was established on Al Russeifa closed landfill in 1997 and system will be replicated for the Ghabawi landfill. The main objective is to reduce the greenhouse gas emissions from the landfill, as well as utilizing the fresh organic waste in the production of methane gas for power generation.
- The Green Amman 2020 (introduced in 2014) focuses on improving the quality and accessibility of open and green spaces in the Amman. Increased green cover will help to absorb more GHG emissions.

Climate change and disaster risk

Table A.12. Climate change and disaster risk - headline data

Existing hazards		
Natural Hazards		
Earthquakes	Floods	
Drought	Transboundary animal and plant diseases	
Heatwave	Crop pests	
Epidemics		
Climate Projections		
Variable	2040-2059	2060-2079
Mean annual temperature	+2.4°C	+3.5°C
Mean annual precipitation	-7.4mm	-10.1mm
Total annual hot days above 35°C	34.5 days	39.6 days
Severe drought likelihood	0.77	0.85

Amman has a diverse climate, characterised by hot summers and cold wet winters. The average annual temperature is between 12.5°C (January) and 23.7°C (August) and the average relative humidity levels range from 42.9% (June) to 74.1% (January). The average temperature for Amman has only slightly increased over the past decades. Amman receives slightly more rainfall than other parts of Jordan, yet it remains arid with less than 250mm of rain per year.

The city has variable micro-climates, for example, snow is common in the west and north, rain is frequent in the centre and the east, and high temperatures are a challenge in the south-east.

Amman has long experienced the impacts of extreme weather including flash floods, earthquakes, droughts, heatwaves, and even occasional frost days and snowstorms in winter months. Historically, flash floods have resulted in the greatest loss of life, but snowstorms have resulted in the most significant economic losses. However, the increase in built-up area in Amman, including the building over and blockage of natural wadis, has increased the risk of flash flooding. In addition to these acute hazards, there are consistent costs to the national and municipal government to address water stress.

Under all future climate scenarios, Amman will face increasing average temperatures with corresponding heatwaves. Similarly, Jordan will face decreasing precipitation and a significantly increased risk for severe drought.

Amman developed a Disaster Risk Management Plan in 2009, as well as a Resilience Strategy in 2016. However, there remains a lack of broad and updated disaster risk reduction (DRR) and climate adaptation strategies. Responsibility for DRR in Jordan lies with the National Department of Civil Defence. Amman's 2009 Disaster Risk Management Strategy focuses on building resilience to earthquake, and less so on spatial DRM and climate change adaptation as a whole. Furthermore, population density is a driver of disaster risk because there are more vulnerable people and assets potentially exposed hazards. Additionally, congested escape routes, dense infrastructure, and poverty can increase the vulnerability of those living in the area to a hazard.

Jordan's third National Communication to the United Nations Framework Convention on Climate Change in 2014 notes that serious impacts are expected based on modelling and projections, including a decrease in annual precipitation with more frequent drought conditions as well as more intense rainstorms when it does fall.

Despite that plans mentioned above, there is a lack of updated and enacted disaster risk reduction and climate adaptation strategies. This partly explains the lack of resilience data available for different sectors. It is unclear how much of Amman's population is at risk from different types of disaster and climate hazards. Improving preparedness through vulnerability assessments will be crucial to increasing Amman's resilience to acute and chronic hazards.

Amman's transport networks are at greatest risk from earthquakes and flash flooding, while snowstorms will likely become less prevalent in future. An emerging risk is heatwaves which, while they have affected Amman in the past, will become more frequent in future due to climate change. Heatwaves are a significant public health risk, increasing both mortality and morbidity (Guo et al. 2018). Moreover, heatwaves can impact the stability and long-term durability of road infrastructure. Heatwaves can also impact rail infrastructure through expansion of tracks which will increase failure rates. Similarly, heatwaves can impact on the operation of existing and planned expansion of traffic management systems in Amman by disrupting the electricity networks. Earthquakes, snowstorms, and flooding present more acute impacts that also disrupt the physical infrastructure of transport networks and the operational flow.

The Jordan Building Code requires engineers to enforce seismic proof construction standards based on a 3-zone map, which is derived from the earthquake risk assessment supported by SDC/UNDP in 2013. Due to rapid urbanisation, not all built infrastructure may have gone through the formal permitting process, particularly with regards to refugees living in informal settlements where tents and makeshift shelters are the primary means of shelter.

Amman imports 97% of its energy and demand is growing by 1.2% per year. Jordan's heavy reliance on imports puts Amman at risk of climate- and disaster-related disruptions to the energy sector, whether those impacts occur in Jordan, in the countries that produce the primary fuel, or at any point along the supply chain. Jordan's pipelines run through Egypt, Israel, Lebanon, and Syria, all of which have been prone to political unrest and may experience natural and climate-related disasters such as earthquakes, flooding, drought, and sea level rise.

Additionally, Jordan will likely experience an increase in energy demand from climate-related pressures, specifically increasing summer temperatures. Hotter summer temperatures and increased frequency of intense heatwaves may create a feedback loop in which the urban heat island effect intensifies; sparking increased uptake of air conditioning systems, which in turn will place greater pressure on energy supplies. The following challenges for climate adaptation and disaster risk in Amman are summarised in the table below:

Table A.11. Climate Change and Disaster Risk Challenges in Amman

Sector	Challenge	Description
Energy	Non-diverse supply	Amman's heavy reliance on imported fuel means it is at risk of climate and natural disaster-related disruptions that occur at the source, along the pipeline, and in Amman.
	Increasing temperatures and cooling requirements	Amman will likely see increased uptake of air-conditioning due to higher summer temperatures, which will put pressure on electrical networks.
	Lack of resilience planning for electrical and fuel networks	No resilience strategies or plans are available for JEPCO or the National Electric Power Company, indicating that resilience planning is inadequate.
Water	Resilience planning for increasing water scarcity	Jordan's precipitation is expected to decrease due to climate change, and hence national water planning under climate change is necessary for water availability in Amman.

Sector	Challenge	Description
	Land use change	Amman's increasing urbanisation has led to substantial growth in built-up areas and the blockage or building over of natural wadis. This has driven flash flooding throughout the city.

The following initiatives are currently underway to address Amman's climate change and disaster risk challenges:

- An ongoing project: 'Strengthening Synergies between Governance of Disaster Risk Reduction and Climate Change Adaptation in Jordan with a View to Reduce Poverty' supported by the UNDP.
- Active steps being taken to integrate disaster risk reduction and climate change, for example developing training protocols for officials, developing data collection and analysis systems and developing communication protocols for stakeholders.

Current responses to environmental challenges

This sub-section outlines the governance structure of Jordan and Amman and outlines key environmental initiatives that are currently in place that respond to the challenges highlighted in the preceding sections.

6.1.4.1 Governance structure

Jordan is a constitutional monarchy where the King is the Head of State and has overall executive authority. The Jordanian political system is based on the separation of powers (Legislative, Executive and Judiciary). The National Constitution of Jordan dictates that the three authorities mandate without interference in other authorities' functionality and governance. The relationship between these three authorities is a balanced, complementary, and participatory one.

Jordan's present legal system is based on the Constitution, the Court Establishment Law of 1951, a civil and criminal code, and the Islamic and ecclesiastical laws in certain cases. The Jordanian Parliament has adopted a bicameral system consisting of the House of Senate (65 members appointed by the King), and the House of Representatives (150 member-selected by citizens). There are 16 sectorial permanent Committees in the House of Senates and 21 Committees in the House of Representatives. The Executive branch is composed of the Prime Minister who heads the Government and the selected Ministers. The Muhafazat al-Asima Governorate is the city of Amman. The administrative division system of the Jordanian Ministry of Interior separates the Muhafazat al-Asima Governorate into nine divisions, of which five are within the districts of the Greater Amman Municipality (GAM). In 1987 the Jordanian Parliament created the GAM as the local government, which covers 22 sub-areas. GAM was intended to centralize urban planning decision-making into one institution, while preserving local representation. Recent changes have resulted in significant organisational disruption for GAM and the surrounding municipalities.

The Mayor of Amman (appointed by His Majesty the King) leads the city council made up of 44 members that are partially elected by the districts and partially appointed by the King. The City Manager has executive responsibility for the on-going management and control of the Municipality. This is further managed by six deputy mayors with responsibility for: Public Services Sector, Districts and Environment, Health and Agriculture, Community Development, Planning and Economic Development, and Finance and Administration.

Appendix B Co-benefits Assessment

This section provides an overview of the broader benefits derived from the proposed actions. The criteria by which these benefits were assessed were developed during the July 2019 stakeholder engagement workshop. This benefits assessment scored the collection of actions against the criteria. For each of the sectors, a benefits table has been laid out that includes the aggregated scores of all actions in that sector per criteria.

B.1. Co-benefit assessment criteria and scoring

Co-benefit category	Indicator	Criteria
Social co-benefits	Action will improve health	Clear health impact of the state of environment which the action is addressing. 3 – high 2 – medium 1 – low
	Improve safety and/or security	Physical safety. Economic and social security 3 – high 2 – medium 1 – low
	Enhance the public realm	Protects heritage assets, promotes walkability, Improves the continuity of streetscape, Clean streets 3 – all of the above 2 – some of the above 1 – One of the above 0 – none
	Access to basic services	Availability and ease of access, waste water as well. 3 –all of the above 2 – some of the above 1 – one of the above 0 – none of the above
	Social equity	3 – high 2 – medium 1 – low 0 – not at all
Economic co-benefits	Revenue generating activities/savings net of costs	The action has the potential to generate revenue, either for the investor, GAM, or in comparison to the counterfactual. 3 – high 2 – medium 1 – low 0 – not at all
	Promotes economic inclusion	Creating jobs, access to capital, lowers social-economic groups 3 – Addresses all of above 2 – Addresses some 1 – Addresses 1 0 – Addresses none
	Avoided damages	The action will reduce the likelihood of damage or disruption to infrastructure, services, or livelihoods. 3 – high 2 – medium 1 – low 0 – not at all
Institutional co-benefits	Improve institutional capacity or efficiency	Capacity building, coordination between departments, improves staff capacities. 3 – all of the above 2 – some 1 – one of the above 0 – none of the above
	Enhances legislative environment	Fills a gap, lack of local legislation, addresses uncertainty, 3 – all of the above 2 – some

	1 – one of the above 0 – none of the above
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Efficient and resilient energy systems and buildings

B.2. Co-benefits of efficient and resilient energy systems and buildings

Co-benefit category	Indicator	Score	Total score
Social co-benefits	Action will improve health	8	45
	Improve safety and/or security	12	
	Enhance the public realm	9	
	Access to basic services	10	
	Social equity	4	
Economic benefits	Revenue generating activities/savings net of costs	8	25
	Promotes economic inclusion	7	
	Avoided damages	10	
Institutional benefits	Improve institutional capacity or efficiency	5	7
	Enhances legislative environment	2	

The actions to support efficient and resilient energy systems and buildings will diversify the energy supply in Amman, help to reduce energy demand by increasing energy efficiency, and decrease the city's overall carbon equivalent emissions. Moreover, many actions have the capacity to provide employment opportunities and to forge partnerships across various institutions and organisations in the city.

Social co-benefits

By diversifying the energy supply through renewable energy integration, these actions **improve energy security, access to basic services, and health outcomes** – particularly for residents living nearer to thermal power plants (TPPs) who are more exposed to air pollutants resulting from energy generation.²¹

With regard to energy efficient buildings, **occupant health** is often improved in several ways. Buildings that are designed or retrofitted for energy efficiency tend to have lower indoor air pollution and less likelihood of overheating or becoming too cold. As a result, occupants may be less likely to experience poor health outcomes such as respiratory illnesses, heat stress, or extreme cold.²²

Additionally, by retrofitting existing buildings, the uptake of which can be promoted through raising awareness around green building design, renters and owners can benefit from lower energy bills for heating and cooling. With proper execution and design this can be especially impactful for lower-income households, for whom energy spending constitutes a greater proportion of their incomes, promoting **social equity**.²³ To be sure, this must be done carefully implemented to ensure that

²¹ Defra. 2018. Air Quality damage cost update. Available from: https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1902271109_Damage_cost_update_2018_FINAL_Issue_2_publication.pdf [Accessed 13 June 2020].

²² Thomson, H., Thomas, S., Sellstrom E., Petticrew, M. 2013. Housing improvements for health and associated socio-economic outcomes. Cochrane Library. Available from: <https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD008657.pub2/pdf/full> [Accessed 14 May 2020].

²³ CEB. 2019. Energy Poverty in Europe: How Energy Efficiency and Renewables Can Help. Available from: https://cebank.org/media/documents/CEB_Study_Energy_Poverty_in_Europe.pdf

low-income households are able to access support for retrofits. Reduction in energy bill burden can also positively influence mental health outcomes, for example through decreasing stress and anxiety related to coping with high bills and debt.²⁴

Economic co-benefits

Increased building efficiency can **generate net savings** on energy spending. The World Resources Institute estimates that every \$1 invested in energy efficiency saves \$2 on energy supply spending.²⁵ This is particularly poignant for Amman's municipal buildings, where a reduction in energy costs would free up capital to direct to other investments and socio-economic initiatives.

Moreover, increasing energy efficiency and energy diversity reduces potential power outages, thereby contributing to **avoided damages, for example travel disruptions or interruptions in production lines**. This is due to decreased energy demand through efficiency measures, and by integrating greater redundancy into the energy supply (e.g. through renewables).

The full package of actions provides a myriad of opportunities for economic inclusion through job creation in development, construction and the demand for new skills surrounding renewable energy development and green building design.

Institutional co-benefits

This suite of actions works to promote existing or forthcoming national legislation and/or targets, including national renewable energy targets and standards and building energy efficiency regulations. Moreover, this will support Amman in contributing to Jordan's INDCs.

Accessible, diverse and low-carbon transport systems

B.3. Co-benefits of accessible, diverse and low-carbon transport systems

Co-benefit category	Indicator	Score	Total score
Social co-benefits	Action will improve health	10	50
	Improve safety and/or security	8	
	Enhance the public realm	10	
	Access to basic services	9	
	Social equity	6	
Economic co-benefits	Revenue generating activities/savings net of costs	7	15
	Promotes economic inclusion	2	
	Avoided damages	6	
Institutional co-benefits	Improve institutional capacity or efficiency	3	7
	Enhances legislative environment	4	

Adopting accessible, diverse and low-carbon transport modes has implications for carbon emission and pollutant reduction, improved health outcomes, and greater accessibility and mobility across Amman.

Social co-benefits

²⁴ IEA. 2019. Multiple Benefits of Energy Efficiency. Available from: <https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/health-and-wellbeing> [Accessed 14 May 2020].

²⁵ Mackres, E. 2016. 4 Surprising Ways Energy-Efficient Buildings Benefit Cities. World Resources Institute. [Online] Available from: <https://www.wri.org/blog/2016/05/4-surprising-ways-energy-efficient-buildings-benefit-cities> [Accessed 14 May 2020].

Sustainable transport modes can **promote health and wellbeing**. The actions which encourage a shift away from private vehicles and integrating electric vehicles into existing public schemes have the potential to reduce NO_x, SO₂, and PM_{2.5} and PM₁₀ emissions.²⁶ Pedestrian-focused transport modes are estimated to have a **weighted health benefit** (of both mortality and morbidity) from increased physical activity of \$1.68 per km for walking and \$1.12 per km for cycling.²⁷

Moreover, broadening access to pedestrian thoroughfares and improving connections and availability of public transport options can increase accessibility to residents of all socioeconomic backgrounds, including those who may not be able to afford a private vehicle. Therefore, these actions can work to **promote social equity** and **access to basic services**.

Furthermore, evidence indicates that increased public transport modes are correlated with decreased traffic accidents. The results of one recent study showed a 37% decrease in accidents among young drivers and a corresponding 24% reduction in associated injuries.²⁸

Economic co-benefits

This suite of actions has the potential to generate a number of jobs including:

- Professional and technical occupations for the development of campaigns as well as new policies and strategies such as the public realm strategy and a SUMP;
- Construction, engineering and manufacturing jobs for the delivery of hard infrastructure such as pedestrian infrastructure and Intelligent Transport Systems (ITS); and
- Long-term jobs to manage and operate new buses.

Studies indicate that pedestrianisation **boosts economic activity**. For example, New York City saw a 49% drop in commercial vacancies in pedestrianised areas, and the UK noted a 40% increase in trading across pedestrianised sites.²⁹ A systematic review³⁰ undertaken by the European Union found that promoting less car dependent mobility options have clear Economic co-benefits. For example, the review noted that promoting cycling spurred **job creation** and **improved journey times**. Additionally, walking benefits hyper-local economies.

The same study indicated that promoting collective passenger transport can bring Economic co-benefits through collective passenger transport, particularly through **increased revenue for the city** from increased use of these systems. Moreover, transport nodes spur economic activity in those areas and central districts, and improved networks can contribute to regeneration schemes.³¹

Resource efficient and holistic waste management systems

B.4. Co-benefits of Resource efficient and holistic waste management systems

Co-benefit category	Indicator	Score	Total score
Social co-benefits	Action will improve health	3	37
	Improve safety and/or security	5	
	Enhance the public realm	12	
	Access to basic services	13	
	Social equity	4	

²⁶ Defra. 2018. Air Quality damage cost update. Available from: https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1902271109_Damage_cost_update_2018_FINAL_Issue_2_publication.pdf [Accessed 13 June 2020].

²⁷ Mulley, C. Tyson, R., McCue, P., Rissel, C., Munro, C. 2013. Research in Transportation Business & Management. 7:27-34.

²⁸ Sadot-Lichtman, S. 2019. Can public transportation reduce accidents? Evidence from the introduction of late-night buses in Israeli cities. *Regional Science and Urban Economics* 74: 99-117.

²⁹ Rapid Transition. 2018. Reclaiming the streets: the increasing trend of pedestrianisation around the world. Available from: <https://www.rapidtransition.org/stories/reclaiming-the-streets-the-increasing-trend-of-pedestrianisation-around-the-world/> [Accessed 15 May 2020].

³⁰ European Platform on Sustainable Urban Mobility Plans. 2016. The Economic co-benefits of Sustainable Urban Mobility Measures: Independent Review of Evidence – Report. Brussels.

³¹ European Platform on Sustainable Urban Mobility Plans. 2016. The Economic co-benefits of Sustainable Urban Mobility Measures: Independent Review of Evidence – Report. Brussels.

Economic co-benefits	Revenue generating activities/savings net of costs	10	30
	Promotes economic inclusion	14	
	Avoided damages	6	
Institutional co-benefits	Improve institutional capacity or efficiency	2	5
	Enhances legislative environment	3	

Social co-benefits

These actions will improve resident's **access to basic services** by improving waste disposal. Additionally, these actions – in particular purchasing more street sweepers and the overall waste hierarchy strategy – will likely have knock-on effects that **improve the public realm** by decreasing litter on streets and in public open spaces. Overall, the proposed actions can **reduce the negative environmental and health impacts** associated with illegal dumping, including reducing the risk of attracting scavenging animals that may be vectors of disease, reducing the likelihood of leachate from hazardous waste infiltrating soil and water supplies, and reducing the likelihood of human-waste cross contamination.³²

Economic co-benefits

The proposed actions to minimise waste and pollution will likely require supporting technical or consultancy services, thereby **generating a wide range of jobs** across multiple sectors including:

- Design, engineering, project management and construction jobs for the construct phase of the new MRF transfer stations, and WEEE facility;
- Collection, processing, management and maintenance jobs at the new or rehabilitated sites; and
- Specialist consultants to develop feasibility studies and strategies for the proposed recycling strategy and organic waste collection scheme.

Additionally, there is potential for **revenue generation** or at least **cost savings** by generating energy from waste to cover the different facilities' energy costs. This includes the organic waste collection scheme which will produce local energy from a dependable feedstock. This can benefit the local and national economy if fed back into the grid by reducing the susceptibility to economic losses from power outages and decreasing the requirement of energy imports. Moreover, the operating model of the MRF may generate municipal revenue through user fees or through the resale of recyclable materials. Similarly, the establishment of recycling practices in the city can generate revenue in the long-term as markets are created for recyclable goods.

Institutional co-benefits

The Waste Prevention and Recycling Strategy **fills an immediate gap in the legislative environment** and will harmonise the city's policies with forthcoming national legislation. Moreover, it will provide opportunity for Greater Amman Municipality to build its capacity in integrating circular principles into the design and delivery of their services and enforcing the regulations.

Integrated water resources management

B.5. Co-benefits of integrated water resources management

Co-benefit category	Indicator	Score	Total score
Social co-benefits	Action will improve health	7	38

1. ³² Cumberland County Improvement Authority. 2015. How does Illegal Dumping Effect Your Health? Available from: <https://www.ccia-net.com/illegal-dumping-effect-health/> [Accessed 13 June 2020].

	Improve safety and/or security	11	
	Enhance the public realm	9	
	Access to basic services	7	
	Social equity	8	
Economic co-benefits	Revenue generating activities/savings net of costs	3	26
	Promotes economic inclusion	11	
	Avoided damages	12	
Institutional co-benefits	Improve institutional capacity or efficiency	4	8
	Enhances legislative environment	4	

Social co-benefits

These actions have the ability to **improve health, enhance the public realm, and increase access to basic services**. The treatment plant decommission and upgrade (W2) will **improve the security and quality** of wastewater treatment, which is essential in Jordan to ensure treated wastewater can be reused as appropriate to efficiently use water resources. Additionally, these actions can enhance the public realm, specifically through mitigating against flood risk and implementing SuDs policies for new builds.

Economic co-benefits

Flooding in Amman is a significant source of damages and lost revenue for households and businesses alike. For example, Amman Chamber of Commerce paid out JOD2 million in damage claims to businesses who had lost revenue during the March 2019 floods in downtown Amman. Therefore, actions that mitigate flood risk could see significant **avoided damages**, including a flood conveyance scheme and integrated nature-based solutions to buffer heavy runoff flows.

SuDS in particular provides significant savings, estimates show SuDS on average have a 4% savings on maintenance cost and 11% saving on construction cost as compared to traditional drainage systems.³³ Similarly, they can reduce heavy metals in runoff by 30-90%, avoiding contamination-related damages and improving water quality overall.

Institutional co-benefits

The SUDS programme fills a legislative gap and will provide GAM the opportunity to build hands-on capacity delivering pilot SuDS schemes.

Comprehensive and reflective land-use planning

B.6. Co-benefits of Comprehensive and reflective land-use planning

Co-benefit category	Indicator	Score	Total score
Social co-benefits	Action will improve health	7	41
	Improve safety and/or security	12	
	Enhance the public realm	15	
	Access to basic services	5	

³³ https://www.susdrain.org/files/resources/cinia_guidance/susdrain_going_with_the_flow_infographic.pdf

	Social equity	9	
Economic co-benefits	Revenue generating activities/savings net of costs	8	25
	Promotes economic inclusion	8	
	Avoided damages	9	
Institutional co-benefits	Improve institutional capacity or efficiency	9	16
	Enhances legislative environment	7	

Social co-benefits

The new land use plan will enhance the coherence of Amman's public realm, and can improve access to basic services through its design and policies. Indeed, **access to basic services** is an important **enabler of social equity**. The new land use plan can contribute to these goals by setting standards for equitable access to nature and services, which are especially critical for lower-income and vulnerable communities. Access to green space also has **measurable positive impacts on physical and mental health outcomes**.³⁴ Estimates indicate that every JOD0.87 spent on green and public open space results in reduced healthcare costs of JOD28.00 due to the physical and mental health benefits provided to visitors. Indeed, green spaces and in particular trees, reduce harmful pollutants in the air.

The servicing and implementation plan in East Amman will promote social equity by driving investment in underserved areas.

Economic co-benefits

The new land use plan will require technical expertise to develop and implement the plan, providing **ample employment opportunities**. Similarly, development of green and open spaces will provide new employment opportunities during the construction phase to workers, landscapes designers, gardens and other contractors. Further maintenance and management employment opportunities will also be necessary.

In addition to a comprehensive land use plan, green and open spaces enhance the public realm and thereby boost nearby property values and provide foot traffic to local businesses. Indeed, green and open spaces are estimated to provide a JOD1.55 to 3.77 benefit per visit.³⁵

The servicing and implementation plan for East Amman will provide ample revenue generating opportunities depending on the operating model of development. Ideally, it will create a stable investment environment for developers and other investors, helping the city to maximise its potential. It can also provide employment opportunities as it receives investment.

Institutional co-benefits

The new land use plan will provide a clear framework upon which GAM can plan and enforce urban development policies. It will build their capacity to deliver through clear standards, protocols, and enforcement measures.

Responsive and forward-looking climate adaptation practices

B.7. Co-benefits of Responsive and forward-looking climate adaptation practices

Co-benefit category	Indicator	Score	Total score
Social co-benefits	Action will improve health	3	13

³⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/357411/Review8_Green_spaces_health_inequalities.pdf

³⁵ Department for Environment, Food & Rural Affairs (2015) Environmental Value Look-Up Tool. Available at: <https://effec.co.uk/project/%20%09environmental-value-look-up-tool> [Accessed 17 July 2019].

	Improve safety and/or security	3	
	Enhance the public realm	4	
	Access to basic services	0	
	Social equity	3	
Economic co-benefits	Revenue generating activities/savings net of costs	1	3
	Promotes economic inclusion	0	
	Avoided damages	2	
Institutional co-benefits	Improve institutional capacity or efficiency	4	4
	Enhances legislative environment	0	

Social co-benefits

This package of actions will specifically target urban heat island and flood risk in Amman, which pose risks to safety and health. Urban heat island is associated with increased daytime temperatures, reduced night-time cooling and higher air pollution levels.³⁶ These in turn place a burden on human health, including through respiratory illness and heat-related illnesses. Actions that mitigate the risk associated with these hazards (e.g. CA1, CA2, CA3, CA7) can improve health or mitigate against avoidable health impacts.

There is strong evidence that social networks contribute to building community resilience in the face of climate-related events such as heatwaves and floods.³⁷ Therefore, using participatory methods to develop a Community Climate Change Engagement Plan has the potential to integrate tools to build social networks as a means to increase community resilience.

Additionally, actions CA2, CA3 and CA5 aim to increase data availability and knowledge-sharing, which can ideally promote access to basic services and social equity.

Economic co-benefits

Not only are the social impacts of climate change significant if no action is taken, so too are the economic impacts. Studies indicate that the economic impacts of heatwaves from reduced productivity could range from 1.9 billion euros to 2.3 billion euros annually per city.³⁸ Thus, actions that mitigate UHI or seek to adjust behaviour patterns to mitigate against the impacts are critical (CA1, CA2, CA7).

There are some opportunities that climate change presents, largely in the form of **new employment opportunities** for those working in the field. These actions include investments and policies that will require employment across a range of sectors, from consultants, landscapers, data scientists, and civil servants.

Institutional co-benefits

Amman has a solid foundation of climate change strategies and objectives – the GCAP aims to operationalise many of these goals by developing our own data sources and expertise to incorporate into future planning (CA5, CA8).

³⁶ USEPA. 2019. 'Heat Island Impacts.' <https://www.epa.gov/heat-islands/heat-island-impacts#:~:text=increased%20daytime%20temperatures%2C%20reduced%20nighttime,%2C%20and%20heat%20related%20mortality,https://theconversation.com/how-your-social-network-could-save-you-from-a-disaster-96450>

³⁷ Aldrich, D. and Melaxa, D. 2018. 'How your social network could save you from a disaster.' <https://theconversation.com/how-your-social-network-could-save-you-from-a-disaster-96450>

³⁸ Costa, Hella. 2016. Heat waves, productivity, and the urban economy: What are the costs? *London School of Economics*. <http://www.lse.ac.uk/GranthamInstitute/news/heat-waves-productivity-and-the-urban-economy-what-are-the-costs/>

FINAL DRAFT

Appendix C CO2 Assumptions

Calculations

Sector	Action #	Action (Text)	GHG Impact	GHG Unit	Assumptions Made	Data Sources
Land Use	LU1	Develop an integrated green infrastructure strategy	165	tCO2	-Planting area will be 3,870sqm, of which 50% will be trees and 50% shrubs.	https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:151:0019:0041:EN:PDF
Waste	SW4	Partner with large-scale commercial sectors to collect organic waste	722	tCO2e (for period 2020-2023, the timeframe of the action)	<ul style="list-style-type: none"> - 220 tonnes of organic waste from hotels per year - Digesting 1 tonne of food waste can generate about 300 kWh of energy - Assumed energy from AD would replace grid electricity - Emissions intensity of grid electricity in Jordan = 0.679 kgCO2e/ kWh. From 2017, as this is the most recent publicly available data. 	www.biogas-info.co.uk/about/faqs www.eib.org/attachments/strategies/eib_project_carbon_footprint_methodologies_en.pdf
Transport	T4.1	Provide free bus service to and from the pilot pedestrian area on specified days.	7	% saving	<ul style="list-style-type: none"> -Unable to calculate emissions savings from uptake of free bus service, instead calculations made based on emission savings if bus fleet were to be hybrid/ electric as opposed to existing buses, -Existing bus fleet unknown so assumed comply with Euro-2 and Euro-3 standards. - Energy intensity of the UK = 0.256 kgCO2e/ kWh - Energy intensity of Jordan = 0.679 kgCO2e/ kWh - Average EV car energy requirement = 0.17 kWh/km - UK Power & Distribution losses for electricity = 8.35% - Jordan Power & Distribution losses for electricity = 10.746% 	www.eib.org/attachments/strategies/eib_project_carbon_footprint_methodologies_en.pdf https://pushevs.com/2016/11/23/electric-cars-range-efficiency-comparison/ https://data.worldbank.org/indicator/eg.elc.loss.zs

Appendix D Environmental Indicator Data

Legend				
High	High performance relative to pre-defined benchmarks in EBRD's GCAP methodology			
Medium	Moderate performance relative to pre-defined benchmarks in EBRD's GCAP methodology			
Strong	Strong performance relative to pre-defined benchmarks in EBRD's GCAP methodology			

Name	Units	Latest value	Trend	Context
State indicators				
Air quality				
Average annual concentration of PM2.5		50	NA	Data from the World Health Organisation (2015 Climate and health profile for Jordan).
Average annual concentration of PM10		74.32	Unclear	Data is available for 2014/15, 2015/16 and 2016/17 from the Jordanian Ministry of Environment Air Quality Reports.
Average annual concentration of PM10 (King Hussein Park)		48.65	Unclear	
Average annual concentration of PM10 (GAM)		70.6	Unclear	
Average annual concentration of PM10 (Tabarhour)		79.75	Unclear	
Average annual concentration of PM10 (Marka – Mahata)		97.85	Unclear	
Average annual concentration of PM10 (JU st – Sweileh)		69.65	Unclear	
Average annual concentration of PM10 (KAC - Sahab)	µg/m3	70.85	Unclear	
Average annual concentration of PM10 (Al Yarmouk Park – Wadi Rimam)		82.9	Unclear	Data is available for 2014/15, 2015/16 and 2016/17 from the Jordanian Ministry of Environment Air Quality Reports.
Average daily concentration of SO2		24.76	Unclear	
Average daily concentration of SO2 (King Hussein Park)		13.49	Unclear	
Average daily concentration of SO2 (GAM)		31.96	Increasing	
Average daily concentration of SO2 (Tabarhour)		No data	NA	
Average daily concentration of SO2 (Marka – Mahata)		40.48	Increasing	
Average daily concentration of SO2 (JU st – Sweileh)		No data	NA	
Average daily concentration of SO2 (KAC - Sahab)		21.38	Unclear	

Name	Units	Latest value	Trend	Context
Average daily concentration of SO ₂ (Al Yarmouk Park - Wadi Rimam)		16.47	Unclear	
Average daily concentration of NO _x		35.64	Unclear	
Average daily concentration of NO _x (King Hussein Park)		21.81	Unclear	
Average daily concentration of NO _x (GAM)		49.63	Unclear	
Average daily concentration of NO _x (Tabarhour)		48.69	Unclear	NO ₂ data presented as NO _x . Data is available for 2014/15, 2015/16 and 2016/17 from the MoEnv Air Quality Reports.
Average daily concentration of NO _x (Marka - Mahata)		50.57	Unclear	
Average daily concentration of NO _x (JU st - Sweileh)		21.04	Unclear	
Average daily concentration of NO _x (KAC - Sahab)		25.57	Decreasing	
Average daily concentration of NO _x (Al Yarmouk Park - Wadi Rimam)		32.15	Unclear	
Average annual concentration of TSP		No data	NA	No data available.

Water quality and availability

Biochemical Oxygen Demand BOD in rivers and lakes		No data	NA	There are no water bodies in Amman.
Biochemical Oxygen Demand BOD (Amman-Zarqa Seal)		32.94	Unclear	Data was obtained from WAJ laboratories.
Biochemical Oxygen Demand BOD (Abu Nusir WWTP Effluent)		32	Increasing	Since this station will be closed in approximately 2 years, the water will be transferred to Khirbet Alsamra treatment plant.
Biochemical Oxygen Demand BOD (Wadi Alsir WWTP Effluent)		47.31	Increasing	This plant has been recently renovated, therefore; the readings will therefore decrease.
Biochemical Oxygen Demand BOD (South Amman WWTP Effluent)	mg/L	17.5	Unclear	Data was obtained from WAJ laboratories.
Biochemical Oxygen Demand BOD (Al Fuaies WWTP Effluent)		31.5	Erratic	
Ammonium NH ₄ concentration in rivers and lakes		No data	NA	There are no water bodies in Amman.
Ammonium NH ₄ concentration (Amman-Zarqa Seal)		2.97	Decreasing	Data was obtained from WAJ laboratories.
Ammonium NH ₄ concentration (Abu Nusir WWTP Effluent)		44.03	Erratic	Since this station will be closed in approximately 2 years, the water will be transferred to Khirbet Alsamra treatment plant.
Ammonium NH ₄ concentration (Wadi Alsir WWTP Effluent)		78.45	Erratic	This plant has been recently renovated, therefore; the readings will therefore decrease.

Name	Units	Latest value	Trend	Context
Ammonium NH4 concentration (South Amman WWTP Effluent)		8.99	Unclear	Data was obtained from WAJ laboratories.
Ammonium NH4 concentration (Al Fuaies WWTP Effluent)		9.34	Erratic	
Percentage of water samples in a year that comply with national potable water quality standards	%	0.997	Erratic	The water complies 100% with the national strategy at the source of pumping; however, due to issues such as pipe leakage or contaminated water tanks. Which are microbiological issues. There were 28 complaints regarding the water quality in 2017 and 30 complaints in 2018.
Water Exploitation Index	MCM	No data	NA	No data available.
Percentage reuse from south amman WWTP	%	50%	NA	This data is related to south Amman WWTP only and it is in % where 50% is reused for agricultural purposes.
Percentage reuse from south amman WWTP		18%	NA	Data was obtained from WAJ laboratories.
Percentage reuse from Wadi El Ser WWTP		100%	NA	
Percentage reuse from Abu Nser WWTP		16%	NA	
Percentage reuse from Fuhais and MahisWWTP		100%	NA	
Soil				
Number of contaminated sites	CSs / 1000 inh (or km2)	No data	NA	MoEnv and GAM confirmed that there is no data available for these indicators.
Concentration of mercury in soil	mg/kg	No data	NA	
Concentration of cadmium in soil		No data	NA	
Concentration of zinc in soil		No data	NA	
Concentration of mineral oil in soil using infrared spectroscopy		No data	NA	
Green space				
Open green space area ratio per 100,000 inhabitants	m2/capita	0.73	NA	Using GIS files provided by GAM, 0.73 m2/capita was calculated based on 4 million inhabitants and 801.92km2 land in Amman (land and population figures are from the World Bank data provided by GAM GIS department).
Share of green space areas within urban limits	%	3.67	NA	Reference to the environmental action plan of GAM, this is the summation of parks, agriculture and reserved green areas in 2011.
Biodiversity and ecosystems				
Abundance of bird species all species	Annual % of change	No data	NA	RSCN identified that as Amman has very limited green spaces and trees and with

Name	Units	Latest value	Trend	Context
Abundance of other species		No data	NA	the extent of construction over the years – that there is no recorded bird species in the city. There is also no data available for the abundance of other species in Amman.
Greenhouse gas emissions (climate change mitigation)				
Annual CO2 equivalent emissions per capita	Tonne / year / capita	2.43	Increasing	Data was obtained from World Bank CURB tool.
Annual CO2 emissions per unit of GDP	Tonne / m. USD of GDP	No data	NA	No data available.
Resilience to natural disaster risks (climate change adaptation)				
Estimated economic damage from natural disasters floods droughts earthquakes etc. as a share of GDP	%	No data	NA	Percentage damage for floods may be available at GAM however financial damage data is not available.
Percentage of public infrastructure at risk		No data	NA	No data available.
Percentage of households at risk		No data	NA	
Pressure Indicators				
Transport				
Average age of car fleet (total and by type)	Years	19	NA	Data was obtained from GAM.
Percentage of diesel buses in total vehicle fleet (Buses)	%	100%	Decreasing	
Percentage of diesel cars in total vehicle fleet (Cars)		0%	NA	Data was only available for 2010.
Fuel standards for light passenger and commercial vehicles	EURO	No data	NA	No data available (only gasoline and diesel specifications are available).
Share of total passenger car fleet run by electric hybrid fuel cell Liquefied Petroleum Gas LPG and Compressed Natural GasCNG energy total and by type	%	No data	NA	Data was obtained from DVLD.
Share of total passenger car fleet run by electric hybrid fuel cell Liquefied Petroleum Gas LPG and Compressed Natural GasCNG energy total and by type (Hybrid)		11%	Increasing	
Share of total passenger car fleet run by electric hybrid fuel cell Liquefied Petroleum Gas LPG and Compressed Natural GasCNG energy total and by type (Electric)		0.3%	Increasing	
Share of total passenger car fleet run by electric hybrid fuel cell Liquefied Petroleum Gas LPG and Compressed Natural GasCNG energy total and by type (Gasoline)		90%	NA	

Name	Units	Latest value	Trend	Context
Average Utilization Rate of public transportation	Passenger / vehicle / hour	No data	NA	GAM confirmed that there is no data available for this indicator.
Transport modal share in commuting cars motorcycles taxi bus metro tram bicycle pedestrian	Private transport %	68%	NA	Data was obtained from the TMMP report 2010. The value is a summation of summation of 15% (for single car ownership) and 50% (for multiple car ownership).
Transport modal share in total trips	%	No data	NA	No data available.
Transport modal share in total trips (Bus or minibus)		28%	Erratic	This data was provided by Urban Observatory through a traffic model, however the data provided for other sectors have not been accurate and therefore this data is to be used as indicative only.
Transport modal share in total trips (Others)		10%	Erratic	
Transport modal share in total trips (Walking)		10%	Erratic	
Motorisation rate	Number of vehicles per capita	0.31	Erratic	Data was obtained from the DoS annual reports. Value is not accurate because total number of vehicles was divided by Amman governorate population.
Motorisation rate		0.3	Erratic	Data was obtained from GAM.
Motorisation rate – number of 2 wheeled vehicles		0.0009	Erratic	The type of '2 wheeled' vehicle was never specified by Urban Observatory; however this is assumed to be motorbikes or scooters and not bicycles.
Average number of vehicles cars and motorbikes per household (Private vehicles)	Number of vehicles per household	1.29	NA	Data was obtained from GAM (from the 2015 census).
Number of private cars / person	Number of cars / capita	0.28	Erratic	Data was obtained from GAM.
Kilometres of road dedicated exclusively to public transit per 100,000 population	Km / person	0	Static	Data was obtained from GAM. 28km of public transit road is under construction to be opened in 2021.
Kilometres of bicycle path per 100,000 population		0.173	Increasing	Data was obtained from Urban Observatory.
Share of population having access to public transport within 15min by foot	%	85%	NA	Data was obtained from GAM (from the TMMP 2008 report).
Frequency of bus service	Average number of passengers at station per hour, in total bus network	No data	NA	No data available.
Percentage of public transportation journeys out of total transport journeys per year	%	6%	NA	Data was obtained from GAM.
Number of private and public vehicles	Vehicles	712418	Increasing	
Number of private vehicles		632127	Increasing	
Average travel speed on primary thoroughfares during peak hour to the posted speed limit on the road	Km/h	36	Increasing	Data was obtained from the 2010 TMMP report.
Travel speed of bus service on major thoroughfares (daily		No data	NA	Amman uses the international limits however there is no solid available data.

Name	Units	Latest value	Trend	Context
average) to the posted speed limit of the road				
Probability of Interruption (failure) of public transport systems in case of specific hazard	Probability of service interruption (%)	No data	NA	No data available.
Probability of Interruption (failure) of transport emergency systems in case of specific hazard		No data	NA	
Buildings				
Electricity consumption in buildings	GWH	14299	Increasing	Data was obtained from EMRC annual statistics. Data is in GWH, (not per m2) for Jordan (not Amman) and includes households, governmental , commercial and hotels and industrial sectors (excluding street lighting, agriculture and others).
Electricity consumption in residential buildings	kWh/m2	No data	NA	No data available.
Electricity consumption in residential buildings	kWh	1221000660	Unclear	Data was obtained from JEPSCO, for the areas that it serves. Amman's percentage could be assumed 50-60%
Electricity consumption in non-residential buildings	kWh/m2	No data	NA	
Electricity consumption in commercial	kWh	375674605	Unclear	
Electricity consumption in small industries		143387803	Unclear	
Electricity consumption in medium industries		291772064	Unclear	
Electricity consumption in large industries		11864800	Unclear	
Electricity consumption in water pumps		90442343	Unclear	
Electricity consumption in agriculture		25169208	Unclear	
Electricity consumption in commercial water pumps		14612247	Unclear	
Electricity consumption in street lighting		41907842	Unclear	
Electricity consumption in radio and TV		1134224	Unclear	
Electricity consumption in hotels		39330768	Unclear	
Electricity consumption in employees		10575052	Unclear	
Electricity consumption in charities		38788934	Unclear	
Electricity consumption in armed forces		69385344	Unclear	
Electricity consumption in government		77912858	Unclear	
Electricity consumption in charging points for cars		442702	Unclear	

Name	Units	Latest value	Trend	Context
Electricity consumption in others		6289790	Unclear	
Heating cooling consumption in buildings fossil fuels residential buildings fossil fuels	kWh/m2	No data	NA	No data available. JEPCO's responsibility ends once the meter is installed and whatever is consumed cannot be determined by the bill.
Heating cooling consumption in residential buildings fossil fuels		No data	NA	
Heating cooling consumption in non-residential buildings fossil fuels		No data	NA	
Share of city enterprises with ISO50001/EMAS certification or similar	%	No data	NA	Amman uses the international limits however there is no solid available data.
Buildings with JGBC codes	No.	1	Static	Data was obtained from GAM.
Buildings with LEED certification		1	Unclear	
Buildings with Edge certification		1	NA	
Total value of projects with green building certification as a share of the total value of projects granted a building permit per year	%	No data	NA	No data available, however according to GAM there are 1 to 5 buildings per year.
Industries				
Electricity consumption in industries per unit of industrial GDP	kWh / 2010 USD	3910	Erratic	Data was obtained from the EMRC annual statistics. Data is in GWH and for Amman only.
Heat consumption in industries per unit of industrial GDP		No data	NA	No data available.
Heavy metals Pb emission intensity of manufacturing industries	kg heavy metals equivalent released per million USD GVA	No data	NA	
Fossil fuel combustion in industrial processes per unit of industrial GDP	MJ / USD	No data	NA	
Share of industrial energy consumption from renewable energy	%	No data	NA	
Capacity of renewable energy systems - industrial use	Ku	3199	Unclear	Data was obtained from JEPCO, for the areas that it serves. Amman's percentage could be assumed 50-60%
Share of industrial waste recycled as a share of total industrial waste produced	%	No data	NA	No data available.
Percentage of industrial wastewater that is treated according to applicable national standards		No data	NA	
Energy				

Name	Units	Latest value	Trend	Context
Share of population with an authorised connection to electricity	%	99.3%	Unclear	Data was obtained from Urban Observatory. With reference to JEPSCO, there is an estimated 1.2 million subscribers.
Annual average number of electrical interruptions per year per customer	# / year / customer	6	Unclear	Data was obtained from NEPCO, and provides electricity for high volt entities and not residential buildings.
Annual average number of electrical interruptions per year per customer	Minute / year	265.2	Unclear	No data available.
Annual average number of electrical interruptions per year per customer	Minute / year	0.589	Decreasing	Data was obtained from JEPSCO, for the areas that it serves. Amman's percentage could be assumed 50-60%. The data is for non-programmed interruptions which means that it is not due to JEPSCO's maintenance works but could be due to general maintenance works by other entities.
Share of population with access to heating cooling	%	No data	NA	No data available.
Proportion of total energy derived from RES as a share of total city energy consumption in TJ		No data	NA	
Percentage of energy produced from renewable energy		15%	Decreasing	Data was obtained from JEPSCO. Indicator depends on the production and consumption of energy.
Average share of population undergoing prolonged power outage in case of climatic extremes over the past 5 years		No data	NA	No data available.
Per capita primary energy consumption	kgoe	996	Erratic	Data was obtained from MEMR annual reports for Amman.
Per capita electricity consumption	kWh	1748	Erratic	
Energy consumption (Crude oil and oil products)	thousand toe	5671	Erratic	
Energy consumption (Coal)		165	Erratic	
Energy consumption (Pet coke)		148	Erratic	
Energy consumption (Natural gas)		3510	Erratic	
Energy consumption (Renewable energy)		515	Increasing	
Energy consumption (Imported electricity)		13	Erratic	
Energy consumption (Transport)		3431	Increasing	
Energy consumption (Industry)		938	Erratic	
Energy consumption (Household)	toa	1549	Increasing	
Energy consumption (Other including commercial, agriculture along with lights)		950	Erratic	

Name	Units	Latest value	Trend	Context
Percentage of sectorial electricity consumption (Household)	%	46%	Increasing	
Percentage of sectorial electricity consumption (Industry)		22%	Decreasing	
Percentage of sectorial electricity consumption (Commercial)		15%	Erratic	
Percentage of sectorial electricity consumption (Water pumping)		15%	Erratic	
Percentage of sectorial electricity consumption (Street lights)		2%	Static	
Electrical energy generated by type of generation (Steam units)	GWh	5060	Erratic	
Electrical energy generated by type of generation (Gas turbines / natural gas)		2361	Erratic	
Electrical energy generated by type of generation (Gas turbines / diesel)		10	Erratic	
Electrical energy generated by type of generation (Diesel units)		2519	Increasing	
Electrical energy generated by type of generation (Hydro units)		54	Erratic	
Electrical energy generated by type of generation (Wind energy)		123	Unclear	
Electrical energy generated by type of generation (Bio-gas)		4	Erratic	
Electrical energy generated by type of generation (Combined cycle)		8708	Erratic	
Electrical energy generated by type of generation (Solar energy)		2	NA	
Water				
Water consumption per capita	L / day / capita	72.75	Erratic	Data was obtained from Urban Observatory and Miyahuna. There is a conflict between these two data sources. Since miyahuna is in charge for water distribution, in Amman and other governorates, it is better to use it as the source of information.
Water consumption per unit of city GDP	L / day / USD	No data	NA	No data available.
Unit of water consumed in power plants per unit of primary energy generated	l / MW / h	No data	NA	

Name	Units	Latest value	Trend	Context
Industrial water consumption as percent of total urban water consumption	%	4%	NA	Data was obtained from the National Water Strategy (2016-2025) for Jordan.
Non-revenue water	%	37%	Erratic	Data was obtained from Miyahuna
Annual average of daily number of hours of continuous water supply per household	h/day	No data	NA	No data available.
Annual average of daily number of hours of continuous water supply per household	h/week	37.15	Erratic	Data was obtained from Miyahuna. Data was provided in h/week. It is important to note that water is not pumped continuously in Amman, as there is intermittent supply.
Percentage of residential and commercial wastewater that is treated according to applicable national standards	%	100%	Static	Data was obtained from GAM.
Percentage of buildings non industrial equipped to reuse grey water		No data	NA	No data available.
Percentage of wastewater from energy generation activities that is treated according to applicable national standards		No data	NA	
Percentage of city population served by wastewater collection		79.4%	Erratic	Data was obtained from Urban Observatory.
Percentage of city's wastewater that has received no treatment		0%	Decreasing	
Percentage of city's wastewater that has receiving primary treatment		100%	Increasing	
Percentage of city's wastewater that has receiving secondary treatment		100%	Increasing	
Percentage of city's wastewater that has receiving tertiary treatment		0%	Static	
Percentage of wastewater treated		100%	Increasing	
Percentage of dwellings damaged by the most intense flooding in the last 10 years		0.025%	Erratic	
Annual number of storm water or sewerage overflows per 100km of network length	Number of events per year	No data	NA	No data available.
Awareness and preparedness to natural disasters	NA	No data	NA	
Solid waste				
Total solid waste generation per capita	kg / year / capita	379.6	Increasing	Data was obtained from GAM. There are discrepancies between the urban

Name	Units	Latest value	Trend	Context
				observatory and the environmental studies' department in GAM.
GDP per domestic material consumption	USD / kg	No data	NA	No data available.
Share of the population with weekly municipal solid waste MSW collection	%	99%	Increasing	Data was obtained from GAM.
Proportion of MSW that is sorted and recycled total and by type of waste e.g. paper glass batteries PVC bottles metals		3%	Increasing	
Percentage of MSW which is disposed of in open dumps-controlled dumps or bodies of water or is burnt		No data	NA	No data available.
Percentage of MSW landfilled disposed of in EU compliant sanitary landfills		100%	Unclear	Data was obtained from Urban Observatory.
Percentage of collected MSW composted		0%	Static	Data was obtained from GAM.
Remaining life of current landfills		Years	16	
Land use				
Population density on urban land	Residents/ km2	557.7	Increasing	Data was obtained from DoS annual reports. This data is for Amman governate, which includes sparsely populated desert areas of East Amman governate. As such, this data likely underrepresents the density in the city itself. Final indicator data of 2516 people/km2 taken from population data (4226700 in 2017) and Amman municipal area (1680 km2).
Average commuting distance	Km	No data	NA	No data available.
Average commuting time	Minutes	75	Increasing	Data was obtained from Urban Observatory.
Proportion of the population living within 20 minutes to everyday services grocery stores clinics etc.	%	No data	NA	No data available.
Average annual growth rate of built-up areas		No data	NA	No data available.
Percentage of urban development that occurs on existing urban land rather than on greenfield land		No data	NA	No data available.
No. of licenses for empty lands/new projects	NA	568	Decreasing	Data was obtained from GAM.
No. of development licenses	NA	2302	Decreasing	Data was obtained from GAM.
Vacancy rates of offices	%	No data	NA	No data available.
Share of multifamily houses in total housing units		No data	NA	No data available.

Appendix E Long-term Actions

This Appendix includes the long-term actions for the Amman GCAP, which will commence in or after 2025.

E.1 Efficient and resilient energy systems and buildings

Action ID	Action title	Related SO
EB7	Establish awareness campaign around national solar-panel subsidy	SO1
EB8	Install rooftop solar units on GAM-owned municipal buildings, parking lots and pergolas	SO1
EB9	Install alternative heating systems in municipal buildings	SO2

EB7: Establish awareness campaign around national solar-panel subsidy		
Strategic objective(s)	SO1: Increase renewable energy supply by 25% by 2035 to improve energy diversity, independence and resilience	
Challenges	Priority environmental challenge (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	Related pressure (Es1) Fossil-fuel dominated energy supply
Description <i>What will be done?</i>	The national government has a policy of solar rebates for residential PV. The city can support this initiative by developing an awareness campaign promoting this rebate among the city's residents. This action aims to increase the uptake of small-scale roof-mounted solar installations and solar water heaters across Amman. GAM will develop an awareness campaign to increase visibility of the national Government's solar panel subsidy. GAM has full jurisdiction over the awareness campaign and will consider developing a unit which assist households in planning and applying.	
Rationale <i>Why is it being proposed?</i>	Incentivising the uptake of solar panel installations is key to support a more diversified energy supply within Amman. Buildings require large amounts of energy and if private businesses were able to transition to renewable energy production the city's overall GHG emissions will be minimized. Furthermore, the widespread adoption of solar technologies around Amman will enhance energy security, reduce the city's reliance on energy imports, and increase the reliability and availability of clean energy supplies.	
Steps for implementation	1. Formalise the project team who will champion the project. 2. Conduct stakeholder mapping 3. Review current updates in existing or announced incentive programs and conduct a SWOT analysis to identify gaps which the project can address. 4. Execute monitoring and evaluation plan with clear targets and KPIs. 5. Check effects of awareness campaign and act accordingly to maximise impact. 6. Link up to national goals for NDCs and national NAMAs.	
Type of action	Plan/strategy	
Plan for delivery	Action owner	Planning Directorate
	Stakeholders	JEPCo, National Electric Power Co (NEPCO), National Government, solar panel suppliers and installers
	Financing options	Municipal budget; central bank concessional loan scheme will be applicable for businesses that are not covered by the 30% residential subsidy above. Jordan Renewable Energy, and Energy Efficiency Fund (REEEF) can finance only small-scale projects.
	Revenue/savings opportunities	Reduced imported energy costs, increased energy security and associated avoided damages.
	Timeline	2025 - 2030

EB8: Install rooftop solar units on GAM-owned municipal buildings, parking lots, and pergolas		
Strategic objective(s)	SO1: Increase renewable energy supply by 25% by 2035 to improve energy diversity, independence and resilience	
Challenges	Priority environmental challenges	Related pressures
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	(Es1) Fossil-fuel dominated energy supply
Description <i>What will be done?</i>	GAM will install rooftop solar units on GAM-owned properties with the aim of supplying a significant portion of municipal energy demands through these renewable sources. This will require an assessment of suitable sites to maximise energy production. Beyond buildings, areas above open parking lots will also be identified, with solar arrays doubling as shading devices. If the project is sizeable enough, then GAM can consider implementing this via a PPP.	
Rationale <i>Why is it being proposed?</i>	Renewable energy production will help Amman to reach its climate mitigation goals. Renewable energy investments will also help to diversify the city's energy supply, creating a more reliable source of energy for generations to come.	
Type of action	Capital project	
Impact measures	State indicators: <ul style="list-style-type: none"> Concentration of PM2.5, PM10, SO2, NOx in air Concentration of mercury, cadmium, and zinc in soil Annual CO₂ emissions per capita and per unit of GDP 	
	Pressure indicators: <ul style="list-style-type: none"> Proportion of total energy derived from renewable energy sources as a share of total city energy consumption % of energy produced from renewable energy sources 	
Plan for delivery	Action owner	Facilities and Building Maintenance Department
	Stakeholders	JEPCo
	Financing options	Donor agencies; municipal budget; potential PPP
	Timeline	2025 - 2030

EB9: Install alternative heating systems in municipal buildings		
Strategic objective(s)	SO2: Reduce the rate of energy demand by 15% by 2030 by improving the energy efficiency of building and electrical systems.	
Challenges	Priority environmental challenges (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	Related pressures (Es1) Fossil-fuel dominated energy supply (Es2) Energy and water performance of buildings
Description <i>What will be done?</i>	As part of the Air Quality and Environment Action Plan, alternative methods/devices for heating systems in municipal buildings will be installed. Simultaneously, GAM will increase enforcement of building insulation codes and green building initiatives to ensure that heating and cooling systems are more environmentally sound.	
Rationale <i>Why is it being proposed?</i>	Inefficient heating systems in municipal buildings are a major source of GHG emissions. If the city is able to enforce better building and insulation codes there could be a major reduction in the carbon footprint of buildings within Amman.	
Type of action	Enforcement	
Impact measures	State indicators: <ul style="list-style-type: none"> Concentration of PM2.5, PM10, SO2, NOx in air Concentration of mercury, cadmium, and zinc in soil Annual CO₂ emissions per capita and per unit of GDP Pressure indicators <ul style="list-style-type: none"> Proportion of total energy derived from renewable energy sources as a share of total city energy consumption % of energy produced from renewable energy sources 	
Plan for delivery	Action owners	Facilities and Building Maintenance Department
	Stakeholders	Designers and suppliers
	Financing options	Municipal budget
	Timeline	2025- 2031

E.2 Accessible, diverse and low-carbon mobility systems

Action ID	Action title	Related SO
T6	Improve pedestrian safety	SO4, SO5
T7	Invest in the construction of a light rail or a tramline network	SO3, SO5
T8	Implement a bike share system	SO4, SO5
T9	Establish dedicated bus lanes on major roads	SO3, SO5
T10	Incorporate mobihubs at critical BRT junctions	SO3, SO4

T6: Improve pedestrian safety		
Strategic objective(s)	SO4: Develop a public realm strategy that supports pedestrian travel SO5: Incorporate smart systems in transport planning	
Challenges	Priority environmental challenge (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	Related pressure (Tr2) Poor pedestrian infrastructure
Description <i>What will be done?</i>	Through a combination of GPS technology and innovative modelling methods, GAM will partner with local universities to model pedestrian movement in Amman. The results of this study will identify road areas that have the highest number of pedestrians crossing (including jaywalking) and determine the hazard involved in these crossings (e.g. typical traffic patterns, number of lanes crossed). GAM will then install controlled pedestrian crossings. These pedestrian crossings would be complemented by 'red-light' cameras to ensure effective enforcement and behaviour change on the part of drivers.	
Rationale <i>Why is it being proposed?</i>	Improving pedestrian accessibility and safety will increase the overall well-being of the citizens of Amman. It will also potentially reduce traffic levels as more commuters choose to walk rather than drive. If the pedestrian infrastructure is improved there could also be a multitude of health benefits for citizens due to more active lifestyles.	
Type of action	Capital project	
Impact measures	State indicators: <ul style="list-style-type: none"> Concentration of PM2.5, PM10, SO2, NOx in air Concentration of mercury, cadmium, mineral oil and zinc in Pressure indicators: <ul style="list-style-type: none"> Transport modal share in total trips [pedestrian and public transport] % road dedicated exclusively for pedestrian use 	
Plan for delivery	Action owner	Traffic Operations Department
	Stakeholders	Jordanian universities, suppliers/construction for installation
	Financing options	Municipal budget
	Timeline	2025 - 2032

T7: Invest in the construction of light rail or a tramline network		
Strategic objective(s)	SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport	
Challenges	Priority environmental challenges (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	Related pressure (Tr1) Lack of public transport infrastructure (Tr3) Emissions from gasoline and diesel vehicles
Description <i>What will be done?</i>	GAM will invest in the construction of light rail or a tramline network within the city centre and from business districts to residential areas. GAM will develop a pilot a light railway project to improve accessibility to major centres of employment. This would involve a feasibility study in part to target the appropriate location. This project will be confirmed through the SUMP (Action T3) and after the commencement of BRT operations.	
Rationale <i>Why is it being proposed?</i>	Improved and more energy efficient rail lines will help to reduce traffic congestion in the city centre as well as reduce overall transport emissions. This will result in cleaner air within the city, a healthier population and help mitigate climate change.	
Type of action	Capital project	
Impact measures	State indicators: <ul style="list-style-type: none"> Concentration of PM2.5, PM10, SO2, NOx in air Concentration of mercury, cadmium, mineral oil and zinc in soil Annual CO2 emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none"> Transport modal share in total trips [pedestrian and public transport] 	
Plan for delivery	Action owner	Public Transport and Infrastructure Transport Projects Directorate
	Stakeholders	Land Transport Regulatory Commission, rail operators, construction operators
	Financing options	Donor; public-private partnership
	Timeline	2025 - 2040

T8: Implement a bike share system		
Strategic objective(s)	SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport SO4: Develop public realm strategy that supports pedestrians travel	
Challenges	Priority environmental challenges (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	Related pressures (Tr1) Lack of public transport infrastructure (Tr2) Poor pedestrian infrastructure
Description <i>What will be done?</i>	GAM will procure a service provider for the development and management of a bike rental system. The specialist support will also determine where to pilot cycle lanes. There is scope to specifically pilot this programme at universities or public parks. This work could also be tied to programmes to teach children to cycle in Sports City. The pilot would then involve scaling up a cycle network and facilities alongside a widespread rollout of the cycle share scheme.	
Rationale <i>Why is it being proposed?</i>	Improved cycling and pedestrian infrastructure will make Amman a more liveable city and helps to encourage exercise within the community while reducing traffic congestion and associated emissions.	
Type of action	Capital project	
Impact measures	State indicators: <ul style="list-style-type: none"> Concentration of PM2.5, PM10, SO2, NOx in air Concentration of mercury, cadmium, mineral oil and zinc in soil Annual CO2 emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none"> Transport modal share in total trips % road dedicated exclusively for pedestrian use 	
Plan for delivery	Action owner	Public Transport and Infrastructure Transport Projects Directorate
	Stakeholders	Cycling companies/suppliers, universities, developers
	Financing options	PPP; municipal budget
	Timeline	2025 - 2031

T9: Establish priority bus lanes on major roads		
Strategic objective(s)	SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport	
Challenges	Priority environmental challenges	Related pressures
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	(Tr1) Lack of public transport infrastructure
Description <i>What will be done?</i>	We will establish priority bus lanes on major roads. These priority bus lanes will improve the attractiveness of public transport because buses will not have to compete with cars and other vehicles, allowing them to move faster through the city. Studies indicate that these bus lanes will allow buses to carry four times as many travellers per hour than if they used traditional lanes. This project will involve a feasibility study that identifies key hot spot areas that would be most appropriate for these bus lanes, possibly by overlaying existing informal bus routes with the BRT route and feeder systems to identify areas for development.	
Rationale <i>Why is it being proposed?</i>	Improved public transportation can reduce the traffic congestion and associated emissions. It will help diversify mobility choices, enabling more people to travel efficiently and affordably.	
Type of action	Capital project	
Impact measures	State indicators: <ul style="list-style-type: none"> Concentration of PM2.5, PM10, SO2, NOx in air Concentration of mercury, cadmium, mineral oil and zinc in soil Annual CO₂ emissions per capita and per unit of GDP Pressure indicators <ul style="list-style-type: none"> Transport modal share in total trips 	
Plan for delivery	Action owner	Public Transport and Infrastructure Transport Projects Directorate, Traffic Operations Department and Roads Directorate
	Stakeholders	Bus operators, construction industry
	Financing options	Municipal budget, international financial institutions
	Timeline	2025 - 2032

T10: Incorporate mobihubs at critical BRT junctions		
Strategic objective(s)	SO3: Increase the modal share of public transportation by 30% by 2030 by institutionalising and normalizing public transport SO4: Develop a public realm strategy that supports pedestrian travel	
Challenges	Priority environmental challenge	Related pressures
	(PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems	(Tr1) Lack of public transport infrastructure (Tr2) Poor pedestrian infrastructure
Description <i>What will be done?</i>	The city will incorporate mobihubs at critical junctions that connect with the new BRT system. Mobihubs (based on the Dutch mobipunt model) are neighbourhood-level transport hubs that link sustainable and shared transport modes. Mobihubs incorporate car-sharing parking spots and/or bicycle storage so people can easily get to BRT junctions. Mobihubs also often incorporate services like public restrooms, small cafes, and post boxes/delivery lockers, among other amenities. These will be tailored to Amman's context and the needs of residents. This work would be done in collaboration with the Directorate of Public Transportation and developed along with the BRT.	
Rationale <i>Why is it being proposed?</i>	Public transport and public amenities around those transport systems is a key service for any major city. Creating neighbourhood-level transport hubs will encourage the use of public transport, thereby reducing traffic levels and increasing the accessibility of public transport.	
Type of action	Capital project	
Impact measures	State indicators: <ul style="list-style-type: none"> Concentration of PM2.5, PM10, SO2, NOx in air Concentration of mercury, cadmium, mineral oil and zinc in soil Annual CO₂ emissions per capita and per unit of GDP Pressure indicators: <ul style="list-style-type: none"> Transport modal share in total trips 	
Plan for delivery	Action owner	Public Transport and Infrastructure Transport Projects Directorate
	Stakeholders	Small businesses and vendors; BRT operators; developers
	Financing options	Donor; Public-private partnership
	Timeline	2030 - 2040

E.3 Resource efficient and holistic waste management systems

Action ID	Action title	Related SO
SW8	Implement mandatory separate collection of key dry recyclable materials	SO6, SO7
SW9	Establish statutory recycling targets	SO7, SO8
SW10	Create a Waste Disposal Levy to increase recycling and recovery and create new jobs	SO6, SO8

SW8: Implement mandatory separate collection of key dry recyclable materials		
Strategic objective(s)	SO7: Integrate circular principles into waste management	
Challenges	Priority environmental challenges	Related pressures
	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.	(Sw1) Solid waste disposal practices
Description <i>What will be done?</i>	GAM will implement the mandatory separation of dry recyclable materials (paper, glass, textile, plastic, rubber, and metal) from non-recyclable waste. This action will be accompanied by an enforcement strategy whereby violators will be fined. Revenue can be generated from these fines and from the establishment of saleable recyclate.	
Rationale <i>Why is it being proposed?</i>	Increasing the life cycle of material will help to reduce the amount of natural resources required to process new goods and products. Recycling will also reduce the amount of material that is disposed of in landfills, increasing their usable life.	
Type of action	Policy	
Impact measures	State indicators: NA	
	Pressure indicators: <ul style="list-style-type: none"> Share of population with weekly municipal solid waste MSW collection % of MSW which is sorted and recycled 	
Plan for delivery	Action owner	Environment and Solid Waste Directorate
	Stakeholders	Collection contractors; landfill/MRF operators
	Financing options	Municipal budget
	Timeline	2025 - 2032

SW9: Establish statutory recycling targets					
Strategic objective(s)	SO7: Integrate circular principles into waste management SO8: Reduce the amount of waste sent to landfill by 12% by 2030				
Challenges	<table border="1"> <thead> <tr> <th>Priority environmental challenges</th><th>Related pressures</th></tr> </thead> <tbody> <tr> <td>(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.</td><td>(Sw1) Solid waste disposal practices</td></tr> </tbody> </table>	Priority environmental challenges	Related pressures	(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.	(Sw1) Solid waste disposal practices
Priority environmental challenges	Related pressures				
(PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.	(Sw1) Solid waste disposal practices				
Description <i>What will be done?</i>	GAM will implement statutory recycling targets for the municipality. To incentivise meeting these targets, each local district may become eligible for a reduced waste collection fee or to gain access to additional funds for community use (e.g. through improving public realm in the district) if they meet targets. This action will take into consideration the possibility of an unintended side effect of illegal dumping outside of municipal boundaries by establishing a clear monitoring scheme. We note that this is ongoing in the national legislature; thus, any municipal-level statutory targets will align with national policy.				
Rationale <i>Why is it being proposed?</i>	In setting statutory recycling targets GAM will be able to begin the shift towards recycling and overall implementation of the solid waste strategy (SW7). A shift towards recycling will increase the life cycle of material and help to reduce the amount of natural resources required to process new goods and products. Recycling will also reduce the amount of material that is disposed of in landfills, increasing their usable life.				
Type of action	Policy				
Impact measures	State indicators: NA Pressure indicators: <ul style="list-style-type: none"> Share of population with weekly municipal solid waste MSW collection % of MSW which is sorted and recycled 				
Plan for delivery	Action owner Environment and Solid Waste Directorate				
	Stakeholders MRF operators; collection industries; residents				
	Financing options Municipal budget				
	Timeline 2025 - 2030				

SW10: Create a Waste Disposal Levy to increase recycling and recovery and create new jobs

Strategic objective(s)	SO8: Reduce the amount of waste sent to landfill by 12% by 2030	
Challenges	Priority environmental challenges (PEC3) Improve waste-related environmental quality (e.g. soil, water, biodiversity impacts) by decreasing waste generation and optimising resource management practices.	Related pressures (Sw1) Solid waste disposal practices
Description <i>What will be done?</i>	GAM will implement a Waste Disposal Levy based on best practice to increase recycling and recovery and create new jobs in enforcement of the policy. The levy will apply to waste disposed in the levy zone or waste that originates in the levy zone and is disposed of in a non-levy area (e.g. based on Queensland's waste levy).	
Rationale <i>Why is it being proposed?</i>	The Waste Disposal aims to encourage recycling and recovery which will increase the life cycle of a material, thereby reducing its over-all carbon impact. Improved waste management processes also helps to ensure that less material ends up in landfills and less energy is required to process the extra waste.	
Type of action	Policy	
Impact measures	State indicators: NA Pressure indicators: <ul style="list-style-type: none"> Total solid waste generation Share of population with weekly municipal solid waste MSW collection % of MSW which is sorted and recycled 	
Plan for delivery	Action owner	Environment and Solid Waste Directorate
	Stakeholders	Waste contractors; residents; enterprises
	Financing options	Municipal budget; eventually funded in part by the levy itself
	Timeline	2025 - 2030

E.4 Integrated water resources management

Action ID	Action title	Related SO
W7	Install water efficient fixtures in GAM buildings	SO13
W8	Implement greywater recycling and rainwater harvesting	SO13
W9	Partner with local NGOs to support low-income communities in rainwater harvesting	SO12

W7: Install water efficient fixtures in GAM buildings		
Strategic objective(s)	SO13: Improve water efficiency by 20% by 2030	
Challenges	Priority environmental challenges	Related pressures
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC6) Management of intensifying drought and overheating risks	(Es2) Energy and water performance of buildings
Description <i>What will be done?</i>	GAM will install water-efficient fixtures in all municipal-owned properties.	
Rationale <i>Why is it being proposed?</i>	Climate change threatens to destabilise the city's water supply and therefore more efficient water fixtures would help to reduce water waste.	
Type of action	Capital Project	
Impact measures	State indicators:	
	<ul style="list-style-type: none"> Water exploitation index Pressure indicators: <ul style="list-style-type: none"> Water consumption per capita 	
Plan for delivery	Action owners	Facilities and Maintenance Department
	Stakeholders	Product suppliers; Miyahuna
	Financing options	Municipal budget
	Timeline	2026 - 2032

W8: Implement greywater recycling and rainwater harvesting		
Strategic objective(s)	SO13: Improve water efficiency by 20% by 2030	
Challenges	Priority environmental challenges	Related pressures
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC6) Management of intensifying drought and overheating risks	(Es2) Energy and water performance of buildings
Description <i>What will be done?</i>	As part of the Climate Action Plan, GAM will install greywater recycling and rainwater harvesting programme at GAM-owned municipal sites. This project will devise a phased implementation strategy to eventually cover all municipal sites that are appropriate.	
Rationale <i>Why is it being proposed?</i>	Greywater recycling and rainwater harvesting will help the city to maximise the use and re-use of water, reducing its carbon footprint (required to pump/extract/process water) and increasing water supplies.	
Type of action	Project	
Impact measures	State indicators:	
	<ul style="list-style-type: none"> Water exploitation index Pressure indicators: <ul style="list-style-type: none"> Water consumption per capita 	
Plan for delivery	Action owner	Facilities and Maintenance Department
	Stakeholders	Product suppliers; Miyahuna
	Financing options	Municipal budget
	Timeline	2026 - 2032

W9: Partner with local NGOs to support low-income communities in rainwater harvesting

Strategic objective(s)	SO12: Improve access to water and wastewater networks	
Challenges	Priority environmental challenge	Related pressure
	(PEC2) Move towards more sustainable water cycle management to reduce impacts of water scarcity (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks	(Wc1) Hydrological changes due to climate change (Lu2) Desertification
Description <i>What will be done?</i>	The city will partner with local NGOs to support low-income communities in rainwater harvesting. Low-income communities have lower access to the knowledge or equipment necessary to implement rainwater harvesting, thus providing trainings in the use of a rainwater harvesting kit will prove invaluable to securing additional water supply. Some in less developed areas of Amman are also not connected to the main water network; therefore, rainwater harvesting can support water access. GAM will host twice yearly free training sessions on rainwater harvesting. Participants will be eligible for a free rainwater container as a participation reward. This will include compiling key material on rainwater harvesting and preparing for public distribution of material on GAM's website. This work will be done in collaboration with the Miyahuna Water Company.	
Rationale <i>Why is it being proposed?</i>	By providing skills and training to low-income communities on the benefits of rainwater harvesting the drought impacts of climate change might be slightly reduced. Allowing individuals to collect freshwater provides an extra level of freshwater security and will also reduce pressures on sewerage systems in the city in times of heavy rain.	
Steps implementation for	<ol style="list-style-type: none"> 1. Survey previous NGO implemented projects for rainwater harvesting, identify the lessons learned from previous examples. 2. Identify low income / vulnerable communities which the project will target. 3. Plan for a total of 6 training sessions annually covering all major governorates in Jordan. 4. Identify suitable NGO(s) with suitable training experience to conduct trainings. 5. Develop a booklet (instruction manual for constructing the system), in Arabic, to be distributed as training material and brochures and public awareness materials in the local communities. 6. Assign a team within GAM to follow up on the training sessions, after the completion of the training, to ensure that sessions were properly implemented, and to get data on pre and post water usage patterns and bill amounts. This data can be used in subsequent training and may be used to secure additional funding for new programs. 	
Type of action	Capacity-building	
Plan for delivery	Action owner	GAM Public Engagement Team
	Stakeholders	NGOs, MWI
	Financing options	Municipal budget; donor agencies
	Revenue/savings opportunities	N/A
	Timeline	2025 – 2027

E.6 Comprehensive and reflective land-use planning

Action ID	Action title	Related SO
LU5	Develop an open space hierarchy	SO13, SO15
LU6	Develop a densification strategy	SO14, SO15
LU7	Regenerate derelict or vacant land	SO13
LU8	Integrate more children's playground in parks	SO13, SO15
LU9	Protect and expand green areas	SO13, SO15
LU10	Establish community allotments	SO13, SO15
LU11	Improve public realm infrastructure	SO15
LU12	Monitor and enforce illegal use of green space	SO15
LU13	Establish a green space fund	SO13, SO15

LU5: Develop an open space hierarchy		
Strategic objective(s)	SO14: Increase the amount of quality green space in Amman SO16: Improve the public realm	
Challenges	Priority environmental challenge	Related pressure
	(PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks	(Lu1) Competing land use priorities and pressures (Lu2) Desertification
Description <i>What will be done?</i>	<p>The city seeks to develop an open space hierarchy that will inform any new development. Open spaces considered in this strategy will be:</p> <ul style="list-style-type: none"> • City-wide parks • Linear greenways • Downtown neighbourhood parks • Public sitting areas in pedestrian walkways • Non-permanent green spaces (e.g. unused streets and public rights of way) • Plazas • Derelict spaces <p>This open space hierarchy will inform the regeneration strategy (LU10) to ensure that open space is integrated into urban regeneration initiatives. This work will also reference and be referenced by the public realm strategy (LU4).</p>	
Rationale <i>Why is it being proposed?</i>	<p>Amman's rapid development often comes at the expense of accessible public and green spaces. Similarly, Amman is facing increased risk of heatwaves with climate change. Both hydrological changes and development are driving desertification. Promoting green open spaces will promote the well-being of the urban ecosystem and residents.</p>	
Type of action	Plan/Strategy	
Impact measures	State Indicators: <ul style="list-style-type: none"> • Open green space area m2/capita • Share of green space areas within urban limits 	
	Pressure Indicators: <ul style="list-style-type: none"> • Percentage of urban development on existing urban land rather than greenfield land 	
Plan for delivery	Action owner	Planning Directorate
	Stakeholders	Environment NGOs, Ministries of Environment and Agriculture
	Financing options	Municipal budget
	Timeline	2025 - 2028

LU6: Develop a densification strategy		
Strategic objective(s)	SO15: Develop an up-to-date land use plan to ensure equitable development across Amman SO16: Improve the public realm	
Challenges	Priority environmental challenges	Related pressures
	(PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC6) Management of intensifying drought and overheating risks	(Lu1) Competing land use priorities and pressures
Description <i>What will be done?</i>	GAM will develop a densification strategy which identifies specific corridor densities and the most appropriate land use mixes with clear criteria guiding development. This strategy will also take into account urban microclimates to generate design strategies that are climate-conscious, prioritise occupant comfort and spatial efficiency. This is already being implemented in conjunction with the BRT; therefore, this action will build upon the work being completed as part of the BRT project.	
Rationale <i>Why is it being proposed?</i>	Densification strategies work to maximise the available space in an urban setting. A densification strategy will help to reduce the pressures to green and open spaces, as well as help to ensure that planning is controlled, and growth is strategic.	
Type of action	Plan/Strategy	
Impact measures	State indicators: <ul style="list-style-type: none"> Open green space area m2/capita Share of green space areas within urban limits Pressure indicators: <ul style="list-style-type: none"> Percentage of urban development on existing urban land rather than greenfield land 	
Plan for delivery	Action owner	Planning Directorate
	Stakeholders	Landlords, construction industry, Jordan Green Building Council
	Financing options	Municipal
	Timeline	2026 - 2032

LU7: Regenerate derelict or vacant land		
Strategic objective(s)	SO14: Increase the amount of quality green space in Amman	
Challenges	Priority environmental challenges	Related pressures
	(PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks	(Lu1) Competing land use priorities and pressures
Description <i>What will be done?</i>	GAM will prioritise the regeneration of derelict land (e.g. unused rail lines, industrial land) and other big empty plots (water infrastructure sites, airfields). To this end, we will conduct an evaluation of derelict or vacant space and commit funding to the rehabilitation of these spaces, prioritising both green and public space with affordable housing. Subsequently, we will invite private sector proposals for the development of these spaces and pursue PPPs or land value capture mechanisms if they align with clear social and environmental benefits. This work will be linked to the GGGI draft on rehabilitating grey field.	
Rationale <i>Why is it being proposed?</i>	Derelict or vacant spaces in cities around the world are being regenerated with great success. These spaces often hold great potential in terms of the contribution they can make environmentally and socially.	
Type of action	Plan/Strategy	
Impact measures	State indicators: <ul style="list-style-type: none"> Open green space area m²/capita Share of green space areas within urban limits 	
	Pressure indicators: <ul style="list-style-type: none"> Percentage of urban development on existing urban land rather than greenfield land 	
Plan for delivery	Action owners	Planning Directorate
	Stakeholders	Landlords; non-profits; developers
	Financing options	Donor agencies; public-private partnership
	Timeline	2025 - 2035

LU8: Children's playgrounds in parks		
Strategic objective(s)	SO14: Increase the amount of quality green space in Amman SO16: Improve the public realm	
Challenges	Priority environmental challenges (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure	Related pressures (Lu1) Competing land use priorities and pressures
Description <i>What will be done?</i>	The city of Amman is interested in constructing children's playgrounds in parks.	
Rationale <i>Why is it being proposed?</i>	Playgrounds within parks would improve the well-being of families living in the city and encourage more social gathering within the city's parks.	
Type of action	Capital project	
Impact measures	State indicators: <ul style="list-style-type: none"> Open green space area m2/capita Share of green space areas within urban limits Pressure indicators: <ul style="list-style-type: none"> Percentage of urban development on existing urban land rather than greenfield land 	
Plan for delivery	Action owners	Public Facilities and Gardens Department
	Stakeholders	Local districts
	Financing options	Municipal budget
	Timeline	2025 - 2035

LU9: Protect and expand green areas		
Strategic objective(s)	SO14: Increase the amount of quality green space in Amman SO16: Improve the public realm	
Challenges	Priority environmental challenges (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks	Related pressures (Lu1) Competing land use priorities and pressures (Lu2) Desertification
Description <i>What will be done?</i>	As part of the Air Quality and Environment Action Plan, GAM will implement the following: (1) Protection and expansion of green areas; (2) Restrictions to any new builds in green areas, where land conversions to be approved only in special cases; and (3) Expand green areas by any possible means; promote urban agriculture; extend parks; promote eco-tourism.	
Rationale <i>Why is it being proposed?</i>	Better quality green space has a multitude of benefits both for the environment and for the community. Green space has been linked to improvements in mental and physical health and any increase in green space will make the city more enjoyable for residents.	
Type of action	Policy	
Impact measures	State indicators: <ul style="list-style-type: none"> Open green space area m2/capita Share of green space areas within urban limits Pressure indicators: <ul style="list-style-type: none"> Percentage of urban development on existing urban land rather than greenfield land 	
Plan for delivery	Action owner	Public Facilities and Gardens Directorate
	Stakeholders	Environmental & Energy conservation NGOs, Ministries of Environment, Agriculture, Transportation, and Public works
	Financing options	Municipal budget
	Timeline	2025 - 2035

LU10: Establish community allotments		
Strategic objective(s)	SO14: Increase the amount of quality green space in Amman SO16: Improve the public realm	
Challenges	Priority environmental challenges (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC5) Management of increasing urban flash flooding risks	Related pressures (Lu1) Competing land use priorities and pressures (Lu2) Desertification
Description <i>What will be done?</i>	GAM will designate new community allotments for city farming, local community spaces, etc. Additionally, we develop urban farming spaces that promote accessibility, inclusivity, pedestrian safety, and social interaction. A priority for initial piloting will be placed on school spaces, where rainwater harvesting, local farming, education and children and adult's awareness raising can be combined.	
Rationale <i>Why is it being proposed?</i>	The provision of green space should be a key planning priority for the city as there are a number of social and environmental benefits. Encouraging the use of shared green spaces will improve the well-being of the residents of Amman.	
Type of action	Plan/Strategy	
Impact measures	State indicators: <ul style="list-style-type: none"> Open green space area m2/capita Share of green space areas within urban limits Pressure indicators: <ul style="list-style-type: none"> Percentage of urban development on existing urban land rather than greenfield land 	
Plan for delivery	Action owner	Planning Directorate
	Stakeholders	Public Facilities and Gardens Directorate; Environmental & energy conservation NGOs, Ministries of Environment, Agriculture, Transportation, and Public works
	Financing options	Municipal budget
	Timeline	2025 - 2033

LU11: Improving public realm infrastructure		
Strategic objective(s)	SO16: Improve the public realm	
Challenges	Priority environmental challenge (PEC1) Managing fossil fuel related air pollution through better management of urban transport and energy systems (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure (PEC6) Management of intensifying drought and overheating risks	Related pressure (Lu1) Competing land use priorities and pressures (Tr1) Lack of public transport infrastructure (Tr2) Poor pedestrian infrastructure
Description <i>What will be done?</i>	<p>The city is interested in developing an integrated green space and pedestrian thoroughfare strategy. GAM will ensure collaboration between the Directorate of Planning and the Department of Public Gardens to build a comprehensive strategy that will incorporate green space into pedestrian networks. This will have the benefit of both providing green space linkages, improving the public realm, and providing cooling and shading in pedestrian areas, thereby making walking a more comfortable method of movement. This will include information derived from climate projections and risk assessments for the city to prioritise areas that will benefit most from shading strategies.</p> <p>This strategy will stand alone but also reflect the discussions around mapping pedestrian spaces. The mapping process will produce a transport map, which then a green space / pedestrian linkage map will potentially be incorporated into. However, this should also link to the urban design guidelines to ensure that trees do not impair pedestrian access.</p>	
Rationale <i>Why is it being proposed?</i>	<p>Green space is proven to have a multitude of beneficial effects on mental and physical wellbeing, and also can reduce the impacts of the urban heat island effect. Incorporating green space into pedestrian networks will help to improve the liability of the city and potentially help to increase pedestrian footfall thereby reducing traffic levels and pressures on public transport.</p>	
Steps for implementation	<ol style="list-style-type: none"> 1. Assess mobility, transport, and walkability around Amman. 2. Review street plans. 3. Review green growth plans in GAM. 4. Assess the possibility of transformation of non-agricultural land into green land to fit with existing land use classification. 5. Assess and enforce roof top use for green usage, to provide more green public space. 6. Develop a green infrastructure plan based on the above and inclusive of goals and targets to be achieved. 7. Produce an action plan including timeline, responsibilities, options, as well as reporting mechanisms. 	
Type of action	Policy	
Plan for delivery	Action owner	Planning Directorate; Design & Planning Environmental Department
	Stakeholders	Ministries of Environment, Agriculture, Transport, Public works, Green NGOs, Jordan Engineers Association, and National building council.
	Financing options	Municipal budget
	Revenue/savings opportunities	TBC
	Timeline	2025 - 2029

LU12: Monitor and enforce illegal use of green space		
Strategic objective(s)	SO16: Improve the public realm	
Challenges	Priority environmental challenge	Related pressure
	(PEC4) Delivery of high quality, accessible and biodiverse green infrastructure	(Lu1) Competing land use priorities and pressures (Lu2) Desertification (Tr2) Poor pedestrian infrastructure (Wc4) Diffuse urban pollution
Description <i>What will be done?</i>	<p>To ensure that the green space is well maintained, the city will monitor and enforce the misuse of public green and open space. Public green and open spaces are often degraded through illegal practices like waste dumping and illegal parking. GAM will increase personnel or systems to monitor open space that is well-known to encounter illegal practices, and provide proper enforcement to deter behaviour. It will take a pragmatic approach where it encounters economically or socially valuable informal uses of green or open spaces, by trying to reach a user agreement based on public benefit principles. This work should be accompanied by an awareness campaign.</p> <p>Recently, there was an agreement to put rangers and police officers inside gardens and parks to prevent degradation. The suggested pilot parks are Al Shabab Public Park, Al Shoura Public Park, Housing Bank Garden, Zahran Park, Salah El-Din Park, Al Hussein Public Parks.</p>	
Rationale <i>Why is it being proposed?</i>	Without the proper enforcement measures put in place, green spaces will not be able to serve their purpose as a healthy, enjoyable environment for all citizens of Amman. To ensure that the city is able to benefit from new green and open space it is important that the areas are well monitored, and any illegal practices are deterred.	
Steps implementation for	<ol style="list-style-type: none"> 1. Make it a requirement for all of GAM staff who work on the streets, to report any signs of tree cutting or damage and investigate the incidents. 2. Require waste collection workers to report residues or garden leftovers and investigate the incidents. 3. Provide sufficient staff and rangers in public parks and major green areas, with sufficient training. 4. Undertake capacity building and produce awareness plans and campaigns. 	
Type of action	Enforcement	
Plan for delivery	Action owner	Planning Directorate
	Stakeholders	Ministry of Environment, Ministry of Agriculture, The royal environmental protection directorate (public security)
	Financing options	Municipal budget
	Revenue/savings opportunities	Ensuring proper use of green space will decrease maintenance costs that GAM will have to spend on spaces that have been improperly used. Additionally, the enhanced quality of green spaces can attract more foot traffic to parks and nearby areas.
	Timeline	2025 - 2028

LU13: Establish a green space fund		
Strategic objective(s)	SO13: Increase the amount of quality green space in Amman SO15: Improve the public realm	
Challenges	Priority environmental challenge (PEC4) Delivery of high quality, accessible and biodiverse green infrastructure	Related pressure (Lu1) Competing land use priorities and pressures (Lu2) Desertification (Wc4) Diffuse urban pollution
Description <i>What will be done?</i>	<p>The city is interested in the development of a green space fund which can be used to improve or create shared community space like gardens or allotments that promotes accessibility, inclusivity, pedestrian safety, and social interaction. GAM will work to create a fund in collaboration with the Directorate of Planning.</p> <p>The fund will be used, in part, to support expanding the 'stewardship day,' where members of the graduating class spend one day planting trees as a requirement of graduation.</p> <p>There is potential to expand this to high schoolers through an awareness campaign. It will be strategic to develop the culture around a "stewardship day" and potentially GAM will partner with local organisations who have corporate social responsibility and may be prepared to donate/ sponsor the event.</p>	
Rationale <i>Why is it being proposed?</i>	Establishing a green fund will help to ensure that the city of Amman will continue to create and enhance green spaces around the city. If there is greater funding made available there is more opportunity for this work to be done strategically and inclusively, ensuring that all members of society are able to partake in the stewardship of their environment. Green spaces are particularly important for the wellbeing of low income and vulnerable groups who do not currently have access to green spaces e.g. garden,	
Steps for implementation	<ol style="list-style-type: none"> 1. Review similar funds. An example in the Jordan Environmental Fund of the Ministry of Environment. 2. Prepare regulations, mechanisms and systems. Encourage local investors to support the initiative. An evidence-driven "business case" argument, as opposed to a general argument appealing to charity, may be more effective at securing funding from non-traditional partners. 3. Conduct awareness campaigns among potential areas. Benefits must be clear and stated to attract understanding and acceptance among local residents. 4. Identify volunteers, who can help facilitate green initiatives, such as the 'Stewardship Day'. 	
Type of action	Plan/Strategy	
Plan for delivery	Action owner	Public Gardens Directorate
	Stakeholders	Ministry of environment. Ministry of Agriculture. Green NGOs.
	Financing options	Municipal budget; Local investors and banks.
	Revenue/savings opportunities	Revenue through partnerships or potential increase patronage of municipal parks
	Timeline	2025 - 2029

E.7 Responsive and forward-looking climate adaptation practices

Action ID	Action title	Related SO
CA4	Develop Amman-specific climate services	SO16, SO18
CA5	Implement carbon offset schemes	SO17
CA6	Implement climate focused land use planning	SO16, SO17
CA7	Establish an Urban Resilience Research centre	SO16, SO18

CA4: Develop Amman-specific climate services		
Strategic objective(s)	SO19: Improve public awareness of climate change	
Challenges	Priority environmental challenges	Related Pressure
	(PEC5) Management of increasing urban flash flooding risks (PEC6) Management of intensifying drought and overheating risks	(Wc1) Hydrological changes due to climate change (Lu1) Competing land use priorities and pressures (Lu2) Desertification
Description <i>What will be done?</i>	The city would like to develop Amman-specific climate services. Climate services refer to tools and products (e.g. near-term and local scale climate projections that can be implemented in prediction systems) that provide climate information to individuals and organisations to help guide their decision-making. GAM will develop a climate service portal on their municipal website that combines up-to-date climate information and tools for users.	
Rationale <i>Why is it being proposed?</i>	By providing climate services to individuals and organisations, decision making that is more focused on climate mitigation and adaptation will be enabled. This will help to make the city more climate resilient, safer and more environmentally conscious.	
Type of action	Capacity-building	
Impact measures	State indicators: <ul style="list-style-type: none"> Estimated economic damage from natural disasters Percentage of public infrastructure at risk Percentage of households at risk Pressure indicators: <ul style="list-style-type: none"> Awareness and preparedness to natural disasters Annual number of stormwater or sewerage overflows per 100 km of network length Percentage of dwellings damaged by the most intense flooding in the last 10 years 	
Plan for delivery	Actions	Amman Urban Resilience Centre
	Stakeholders	National government, universities, research organisations, international financial institutions, non-profits
	Financing options	Municipal budget; public-private partnership; grants
	Timeline	2025 - 2035

CA5: Implement carbon offset schemes		
Strategic objective(s)	SO14: Increase the amount of quality green space in Amman SO17: Institutionalise climate resilience into all aspects of municipal operations and policies	
Challenges	Priority environmental challenges	Related pressures
	(PEC4) Delivery of high quality, accessible and biodiverse green infrastructure	(Lu1) Competing land use priorities and pressures (Lu2) Desertification (Es2) Energy and water performance of buildings
Description <i>What will be done?</i>	GAM will develop and pilot carbon offsetting projects for public buildings and public land that cannot deliver desired carbon reduction savings.	
Rationale <i>Why is it being proposed?</i>	The implementation of carbon offset schemes will help to reduce the over-all carbon footprint of the city and could help to create a healthier environment if the projects are people focused and nature-based.	
Type of action	Capital project	
Impact measures	State indicators: <ul style="list-style-type: none"> Estimated economic damage from natural disasters Percentage of public infrastructure at risk Percentage of households at risk Pressure indicators: <ul style="list-style-type: none"> Per capita emissions of CO₂e 	
Plan for delivery	Action Owners	Facilities and Building Maintenance Department
	Stakeholders	Land owners; developers
	Financing options	Donor agencies; municipal budget
	Timeline	2025 - 2035

CA6: Climate focused land use planning		
Strategic objective(s)	SO17: Institutionalise climate resilience into all aspects of municipal operations and policies	
Challenges	Priority environmental challenges	Related pressures
	(Pc4) Low open green space ratio per capita (Pc5) Low share of green space areas within urban limits	(Lu1) Competing land use priorities and pressures (Lu2) Desertification (Es2) Energy and water performance of buildings
Description <i>What will be done?</i>	GAM will integrate climate hazards into strategic land use planning and development assessments. To this end, GAM will amend policy to require that climate change projections are considered in strategic land use planning and development assessments. Additionally, policy must prioritise risk mitigation. Until more accurate site-specific climate hazard information is available, land use planning and new developments shall at least consider their responsiveness to generally estimated climate change impacts for Amman.	
Rationale <i>Why is it being proposed?</i>	Planning considerations should include climate adaptation and mitigation measures at each step of the process. Considering climate hazards in advance will help to avoid the costs of damages caused by extreme weather.	
Type of action	Policy	
Impact measures	State indicators <ul style="list-style-type: none"> Estimated economic damage from natural disasters Percentage of public infrastructure at risk Percentage of households at risk Pressure indicators <ul style="list-style-type: none"> Per capita emissions of CO₂e 	
Plan for delivery	Action owners	Planning Directorate
	Stakeholders	Universities; research organisations
	Financing options	Municipal budget;
	Timeline	2025 – 2030

CA7: Establish an Urban Resilience Research Centre		
Strategic objective(s)	SO17: Institutionalise climate resilience into all aspects of municipal operations and policies SO19: Improve public awareness of climate change	
Challenges	Priority environmental challenges	Related pressures
	(Pc4) Low open green space ratio per capita (Pc5) Low share of green space areas within urban limits (Pc6) Historical and increasing risk of urban flashing flooding (Pc7) Historical and increasing risk of drought conditions (Pc8) Historical and increasing risk of heatwaves	(Lu1) Competing land use priorities and pressures (Lu2) Desertification (Es2) Energy and water performance of buildings (Wc1) Hydrological changes due to climate change
Description <i>What will be done?</i>	In order to ensure that Amman's residents benefit from a safe, inclusive and resilient built and social environment, we will establish an Urban Resilience Research Centre that will support data collection, monitoring and analysis of key indicators related to resilience across social, environmental and economic sectors. The Urban Resilience Research centre will support GAM's leadership in shaping strategy and corresponding policy to embed resilience across municipal activities.	
Rationale <i>Why is it being proposed?</i>	Building Amman's resilience is crucial in the face of climate change and continued urbanisation.	
Type of action	Plan/Strategy; Capital Investment	
Impact measures	State indicators <ul style="list-style-type: none"> Estimated economic damage from natural disasters Percentage of public infrastructure at risk Percentage of households at risk 	
	Pressure indicators <ul style="list-style-type: none"> Per capita emissions of CO₂e 	
Plan for delivery	Action owners	Planning Directorate
	Stakeholders	Universities; research organisations
	Financing options	Municipal budget;
	Timeline	2025 – 2030