МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ
федеральное государственное бюджетное образовательное учреждение
высшего образования
МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ
ГЕОДЕЗИИ И КАРТОГРАФИИ
(МИИГАиК)

Факультет управления территориями
Кафедра лингвистики

ДОКУМЕНТ ПОДПИСАН
ЭЛЕКТРОННОЙ ПОДПИСЬЮ

Сертификат: 5387FD2AF5B17FED816FDE9A1D4973B1
Владелец: Степанченко Алексей Леонидович
Действителен: с 21.07.2025 по 14.10.2026

«УТВЕРЖДАЮ»
Проректор
А. Л. Степанченко
15 мая 2026 г.

ФОНД ОЦЕНОЧНЫХ СРЕДСТВ ПО ДИСЦИПЛИНЕ (МОДУЛЮ) «Б1.О.03 ИНОСТРАННЫЙ ЯЗЫК»

Уровень высшего образования: бакалавриат

Направление подготовки: 27.03.03 Системный анализ и управление

Направленность (профиль) подготовки: Управление земельно-информационными системами

Квалификация (степень) выпускника: бакалавр

Форма обучения: очная

Год набора (приема на обучение): 2026

Срок получения образования: 4 года

Объем: в зачетных единицах: 6 з.е.
в академических часах: 216 ак.ч.

Москва, 2026

Разработчики:
Заведующий кафедрой Лингвистики, доцент Герасимов И. П.

Старший преподаватель кафедры Лингвистики Ацута Е. В.

Старший преподаватель кафедры Лингвистики Трофименко С. А.

Фонд оценочных средств по дисциплине (модулю) составлен в соответствии с требованиями ФГОС ВО по направлению подготовки 27.03.03 Системный анализ и управление, утвержденного приказом Минобрнауки от 07.08.2020 № 902

Согласование и утверждение

№	Подразделение	Ответственное лицо	ФИО	Виза	Дата, протокол (при наличии)
1	факультет Управления территориями	Председатель ученого совета факультета	Воронцова А. А.	Рассмотрено	25.11.2025, № 8-2025

1. Планируемые результаты обучения, соотнесенные с планируемыми результатами освоения образовательной программы

УК-4 Способен осуществлять деловую коммуникацию в устной и письменной формах на государственном языке Российской Федерации и иностранном(ых) языке(ах)

УК-4.1 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия

Знать:

УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников

УК-4.1/Зн3 Основные виды норм современного русского литературного языка основные характеристики современной социокультурной и языковой ситуации; особенности функциональных стилей; методы и приемы невербального общения в определенных ситуациях общения

УК-4.1/Зн4 Нормы деловой коммуникации на русском и иностранных языках в сфере землеустройства и кадастров недвижимости

Уметь:

УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка

УК-4.1/Ум3 Осуществление выбора языковых средств в соответствии с ситуацией общения; использование различных словарей и справочников для решения конкретных коммуникативных и познавательных задач; использование разных форм коммуникации в устной и письменной речи;

УК-4.1/Ум4 Подбирать соответствующий стиль общения и адаптировать речь к конкретной ситуации

Владеть:

УК-4.1/Нв1 Навыками чтения, аудирования, разговорной речи, письмо в профессиональной области

УК-4.1/Нв4 Навыком эффективного межкультурного взаимодействия и вербальной передачи информации в профессиональном контексте

УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках

Знать:

УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребутельного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи

УК-4.3/Зн3 Основные стилистические особенности письменной формы речи; язык служебных документов; нормы литературного языка, необходимые для реализации коммуникативных намерений.

УК-4.3/Зн4 Стандарты деловой переписки и стилистические особенности официального и неофициального письма на русском и иностранном языках

Уметь:

УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью

УК-4.3/Ум3 Оптимальное использование языковые средства при письменном общении в типичных для профессиональной деятельности ситуациях; реализация коммуникативных намерений в соответствии с нормами современного русского литературного языка правильное использование риторических форм общения в официальной и неофициальной сфере письменной речи. оформление деловой документации различных жанров

УК-4.3/Ум4 Грамотно вести письменную и электронную коммуникацию с учетом особенностей сферы землеустройства и кадастров недвижимости

Владеть:

УК-4.3/Нв3 Владения необходимой языковой информацией и структурирования ее для деловой переписки; осознанного выбора нормативных вариантов единиц языка всех уровней при создании текстов научного и официально-делового стиля.

УК-4.3/Нв4 Навыком правильного подбора стиля и формата сообщений в зависимости от целевой аудитории и культурных различий

2. Показатели и критерии оценивания компетенций

Планируемые результаты освоения программы	Уровень овладения	Критерии оценивания (перечень сформированных ИДК/ЗУВ по уровням освоения)
УК-4 Способен осуществлять деловую коммуникацию в устной и письменной формах на государственном языке Российской Федерации и иностранном(ых) языке(ах)	Повышенный	ИДК УК-4.1 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия Знать: УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Зн3 Основные виды норм современного русского литературного языка основные характеристики современной социокультурной и языковой ситуации; особенности функциональных стилей; методы и приемы невербального общения в определенных ситуациях общения УК-4.1/Зн4 Нормы деловой коммуникации на русском и иностранных языках в сфере землеустройства и кадастров недвижимости Уметь: УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка УК-4.1/Ум3 Осуществление выбора языковых средств в соответствии с ситуацией общения; использование различных словарей и справочников для решения конкретных коммуникативных и познавательных задач; использование разных форм коммуникации в устной и письменной речи; УК-4.1/Ум4 Подбирать соответствующий стиль общения и адаптировать речь к конкретной ситуации

			Владеть: УК-4.1/Нв1 Навыками чтения, аудирования, разговорной речи, письмо в профессиональной области УК-4.1/Нв4 Навыком эффективного межкультурного взаимодействия и вербальной передачи информации в профессиональном контексте ИДК УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках Знать: УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребутельного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Зн3 Основные стилистические особенности письменной формы речи; язык служебных документов; нормы литературного языка, необходимые для реализации коммуникативных намерений. УК-4.3/Зн4 Стандарты деловой переписки и стилистические особенности официального и неофициального письма на русском и иностранном языках Уметь: УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью УК-4.3/Ум3 Оптимальное использование языковые средства при письменном общении в типичных для профессиональной деятельности ситуациях; реализация коммуникативных намерений в соответствии с нормами современного русского литературного языка правильное использование риторических форм общения в официальной и неофициальной сфере письменной речи. оформление деловой документации различных жанров УК-4.3/Ум4 Грамотно вести письменную и электронную коммуникацию с учетом особенностей сферы землеустройства и кадастров недвижимости Владеть: УК-4.3/Нв3 Владения необходимой языковой информацией и структурирования ее для деловой переписки; осознанного выбора нормативных вариантов единиц языка всех уровней при создании текстов научного и официально-делового стиля.

		УК-4.3/Нв4 Навыком правильного подбора стиля и формата сообщений в зависимости от целевой аудитории и культурных различий
	Базовый	ИДК УК-4.1 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия Знать: УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Зн3 Основные виды норм современного русского литературного языка основные характеристики современной социокультурной и языковой ситуации; особенности функциональных стилей; методы и приемы невербального общения в определенных ситуациях общения УК-4.1/Зн4 Нормы деловой коммуникации на русском и иностранных языках в сфере землеустройства и кадастров недвижимости Уметь: УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка УК-4.1/Ум3 Осуществление выбора языковых средств в соответствии с ситуацией общения; использование различных словарей и справочников для решения конкретных коммуникативных и познавательных задач; использование разных форм коммуникации в устной и письменной речи; УК-4.1/Ум4 Подбирать соответствующий стиль общения и адаптировать речь к конкретной ситуации ИДК УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках Знать: УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребутельного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Зн3 Основные стилистические особенности письменной формы речи; язык служебных документов; нормы литературного языка, необходимые для реализации коммуникативных намерений.

		УК-4.3/Зн4 Стандарты деловой переписки и стилистические особенности официального и неофициального письма на русском и иностранном языках Уметь: УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью УК-4.3/Ум3 Оптимальное использование языковые средства при письменном общении в типичных для профессиональной деятельности ситуациях; реализация коммуникативных намерений в соответствии с нормами современного русского литературного языка правильное использование риторических форм общения в официальной и неофициальной сфере письменной речи. оформление деловой документации различных жанров УК-4.3/Ум4 Грамотно вести письменную и электронную коммуникацию с учетом особенностей сферы землеустройства и кадастров недвижимости
	Пороговый	ИДК УК-4.1 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия Знать: УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Зн3 Основные виды норм современного русского литературного языка основные характеристики современной социокультурной и языковой ситуации; особенности функциональных стилей; методы и приемы невербального общения в определенных ситуациях общения УК-4.1/Зн4 Нормы деловой коммуникации на русском и иностранных языках в сфере землеустройства и кадастров недвижимости

		ИДК УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках Знать: УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребутельного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Зн3 Основные стилистические особенности письменной формы речи; язык служебных документов; нормы литературного языка, необходимые для реализации коммуникативных намерений. УК-4.3/Зн4 Стандарты деловой переписки и стилистические особенности официального и неофициального письма на русском и иностранном языках

3. Шкала оценивания

Оценка	Критерии оценивания (перечень сформированных ИДК/ЗУВ)
Отлично	УК-4.1 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Зн3 Основные виды норм современного русского литературного языка основные характеристики современной социокультурной и языковой ситуации; особенности функциональных стилей; методы и приемы невербального общения в определенных ситуациях общения УК-4.1/Зн4 Нормы деловой коммуникации на русском и иностранных языках в сфере землеустройства и кадастров недвижимости УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка УК-4.1/Ум3 Осуществление выбора языковых средств в соответствии с ситуацией общения; использование различных словарей и справочников для решения конкретных коммуникативных и познавательных задач; использование разных форм коммуникации в устной и письменной речи; УК-4.1/Ум4 Подбирать соответствующий стиль общения и адаптировать речь к конкретной ситуации УК-4.1/Нв1 Навыками чтения, аудирования, разговорной речи, письмо в профессиональной области УК-4.1/Нв4 Навыком эффективного межкультурного взаимодействия и вербальной передачи информации в профессиональном контексте

	УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребутельного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Зн3 Основные стилистические особенности письменной формы речи; язык служебных документов; нормы литературного языка, необходимые для реализации коммуникативных намерений. УК-4.3/Зн4 Стандарты деловой переписки и стилистические особенности официального и неофициального письма на русском и иностранном языках УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью УК-4.3/Ум3 Оптимальное использование языковые средства при письменном общении в типичных для профессиональной деятельности ситуациях; реализация коммуникативных намерений в соответствии с нормами современного русского литературного языка правильное использование риторических форм общения в официальной и неофициальной сфере письменной речи. оформление деловой документации различных жанров УК-4.3/Ум4 Грамотно вести письменную и электронную коммуникацию с учетом особенностей сферы землеустройства и кадастров недвижимости УК-4.3/Нв3 Владения необходимой языковой информацией и структурирования ее для деловой переписки; осознанного выбора нормативных вариантов единиц языка всех уровней при создании текстов научного и официально-делового стиля. УК-4.3/Нв4 Навыком правильного подбора стиля и формата сообщений в зависимости от целевой аудитории и культурных различий
Хорошо	УК-4.1 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Зн3 Основные виды норм современного русского литературного языка основные характеристики современной социокультурной и языковой ситуации; особенности функциональных стилей; методы и приемы невербального общения в определенных ситуациях общения УК-4.1/Зн4 Нормы деловой коммуникации на русском и иностранных языках в сфере землеустройства и кадастров недвижимости УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка УК-4.1/Ум3 Осуществление выбора языковых средств в соответствии с ситуацией общения; использование различных словарей и справочников для решения конкретных коммуникативных и познавательных задач; использование разных форм коммуникации в устной и письменной речи; УК-4.1/Ум4 Подбирать соответствующий стиль общения и адаптировать речь к конкретной ситуации

	УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребутельного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Зн3 Основные стилистические особенности письменной формы речи; язык служебных документов; нормы литературного языка, необходимые для реализации коммуникативных намерений. УК-4.3/Зн4 Стандарты деловой переписки и стилистические особенности официального и неофициального письма на русском и иностранном языках УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью УК-4.3/Ум3 Оптимальное использование языковые средства при письменном общении в типичных для профессиональной деятельности ситуациях; реализация коммуникативных намерений в соответствии с нормами современного русского литературного языка правильное использование риторических форм общения в официальной и неофициальной сфере письменной речи. оформление деловой документации различных жанров УК-4.3/Ум4 Грамотно вести письменную и электронную коммуникацию с учетом особенностей сферы землеустройства и кадастров недвижимости
Удовлетворительно	УК-4.1 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Зн3 Основные виды норм современного русского литературного языка основные характеристики современной социокультурной и языковой ситуации; особенности функциональных стилей; методы и приемы невербального общения в определенных ситуациях общения УК-4.1/Зн4 Нормы деловой коммуникации на русском и иностранных языках в сфере землеустройства и кадастров недвижимости УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребутельного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Зн3 Основные стилистические особенности письменной формы речи; язык служебных документов; нормы литературного языка, необходимые для реализации коммуникативных намерений. УК-4.3/Зн4 Стандарты деловой переписки и стилистические особенности официального и неофициального письма на русском и иностранном языках
Неудовле-творительно	Результаты обучения не сформированы на достаточном уровне
Оценка	Критерии оценивания (перечень сформированных ИДК/ЗУВ)

Зачтено	УК-4.1 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Зн4 Нормы деловой коммуникации на русском и иностранных языках в сфере землеустройства и кадастров недвижимости УК-4.1/Зн3 Основные виды норм современного русского литературного языка основные характеристики современной социокультурной и языковой ситуации; особенности функциональных стилей; методы и приемы невербального общения в определенных ситуациях общения УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Зн3 Основные стилистические особенности письменной формы речи; язык служебных документов; нормы литературного языка, необходимые для реализации коммуникативных намерений. УК-4.3/Зн4 Стандарты деловой переписки и стилистические особенности официального и неофициального письма на русском и иностранном языках
Не зачтено	Результаты обучения не сформированы на достаточном уровне

4. Контрольные мероприятия по дисциплине

Вид контроля	Форма контроля/Оценочное средство
Текущий контроль	Контрольная работа
Промежуточная аттестация	Контрольная работа Зачет Экзамен

№ п/п	Наименование раздела	Контролируемые ИДК	Вид контроля/ используемые оценочные материалы	
			Текущий	Промежут. аттестация
1	Вводно-коррективный курс	УК-4.1		Зачет Экзамен
2	Общий курс иностранного языка	УК-4.1	Контрольная работа	Зачет Экзамен
3	Профессионально-ориентированный иностранный язык	УК-4.1 УК-4.3	Контрольная работа	Зачет Экзамен

5. Порядок проведения промежуточной аттестации

Порядок проведения промежуточной аттестации регламентируется локальными нормативными актами Университета:
- Положением о формах, периодичности, порядке текущего контроля успеваемости и промежуточной аттестации обучающихся по основным образовательным программам высшего образования – программам бакалавриата, программам специалитета, программам магистратуры в федеральном государственном бюджетном образовательном учреждении высшего образования «Московский государственный университет геодезии и картографии», п.6 «Организация и проведение промежуточной аттестации».
- Положением о порядке осуществления образовательного процесса, проведения текущего контроля успеваемости и промежуточной аттестации обучающихся с применением электронного обучения и дистанционных образовательных технологий в федеральном государственном бюджетном образовательном учреждении высшего образования «Московский государственный университет геодезии и картографии», п.8 «Проведение промежуточной аттестации с применением ЭО и ДОТ».

Промежуточная аттестация: Зачет, 1 семестр.

Промежуточная аттестация: Экзамен, 2 семестр.

6. Оценочные материалы текущего контроля

Раздел 2. Общий курс иностранного языка
Контролируемые ИДК: УК-4.1

Тема 2.5. Россия в современном мире, Москва, мой родной город.
Форма контроля/оценочное средство: Контрольная работа
Вопросы/Задания:
1. Answer the question:
What does the science of history of architecture study?
1. Architecture development process in connection with the biological processes
2. The relationship between people and animals
3. Architecture development process in connection with the historical processes
2. Choose the correct expression:
The detailed study of a site is
1. site analysis
2. bird analysis
3. cat analysis
3. Complete the sentence using the correct word:

_____ is your address?
1. What
2. How
3. That
4. Do you speak Japanese? No, I _____.
1. speaking not
2. speak not
3. don’t
5. Pick up the correct word:
a person or company, responsible for the physical construction of a building is _____
1. scientist

2. constructor
3. doctor

6. What do we call:
a thin tall structure usually rising above the castle or building that it is attached to?
1. tower
2. table
3. tree

7. When was the University of .Geodesy and Cartograpy founded?
1. 1779
2. 1920
3. 2000

8. What do modal verbs show?
1. modality
2. time
3. voice

9. Choose the correct sentence:
1. I am a student.
2. A student I am.
3. A student am I.

10. Раскройте скобки, употребляя глаголы в требующемся времени.
When I (to come) to Pete's house last Sunday, he (to read) a new book

11. Раскройте скобки, употребляя глаголы в требующемся времени.
Yesterday I (to buy) a new pair of gloves, as I (to lose) the old ones.

12. Раскройте скобки, употребляя глаголы в требующемся времени.
I (to meet) him when he (to walk) across the park.

13. Раскройте скобки, употребляя глаголы в требующемся времени.
Don't enter the bedroom! The child (to sleep) there, and he always (to wake) up when somebody (to open) the door.

14. Раскройте скобки, употребляя глаголы в требующемся времени.
What the children (to do) now? — Oh, they (to play) the new table game which I (to buy) for them the day before yesterday.

15. Раскройте скобки, употребляя глаголы в требующемся времени.
We could not go out because it (to rain) hard since early morning.

16. Раскройте скобки, употребляя глаголы в требующемся времени.
When I (to come) home yesterday, my sister already (to return) and (to sit) at the fireplace looking through some old photographs.

17. Раскройте скобки, употребляя глаголы в требующемся времени.
When morning came, the storm already (to stop), but the snow still (to fall).

18. Раскройте скобки, употребляя глаголы в требующемся времени.
I (to hear) this song several times already, but I cannot remember the words.

19. Передайте следующие предложения в Passive Voice.
I bought potatoes yesterday.

20. Передайте следующие предложения в Passive Voice.
We will bring the books tomorrow.

21. Передайте следующие предложения в Passive Voice.
They are repairing the clock now.

22. Передайте следующие предложения в Passive Voice.
I have translated the whole text.

23. Передайте следующие предложения в Passive Voice.
They broke the window last week

24. Передайте следующие предложения в Passive Voice.
They were playing tennis from four till five.

25. Передайте следующие предложения в Passive Voice.
By six o'clock they had finished the work.

26. Передайте следующие предложения в Passive Voice.
They are building a new concert-hall in our street.

27. Передайте следующие предложения в Passive Voice.
Livingstone explored Central Africa in the 19th century.

28. Передайте следующие предложения в Passive Voice.
They haven't brought back my skates.

29. Передайте предложения в косвенную речь.
“My friend lives in Moscow”, said Alec.

30. Передайте предложения в косвенную речь.
“I can’t explain this rule to you”’ said my classmate to me.

31. Передайте предложения в косвенную речь.
He said:” I have just received a letter from my uncle”

32. Передайте предложения в косвенную речь.
She asked me: ”What will you do tomorrow?”

33. Передайте предложения в косвенную речь.
She asked me:”Why did you come here yesterday?”

34. Передайте предложения в косвенную речь.
I asked me uncle: ”How long did you stay in Moscow?”

35. Передайте предложения в косвенную речь.
The teacher said to me:”Does your father work at a factory?”

36. Передайте предложения в косвенную речь.
“Did you go shopping yesterday?”, said grandmother to Mary

37. Передайте предложения в косвенную речь.
Father said to Nick:”Have you done your homework?”

38. Передайте предложения в косвенную речь.
“Tom, go to bed”, said his mother.

39. Передайте предложения в косвенную речь.
Kate said to her grandmother:”Help me to cook the soup, please”.

40. Передайте предложения в косвенную речь.
“Don’t play in the street”, said the van to the boys.

41. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
the party / Linda / to / come / might / tonight.

42. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
round / work / have to / farmers / the year / all.

43. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
you / not / hospital / noise / must / make / in.

44. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
the light / I / switch / may / on ?

45. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
your / look / could / passport / I / at ?

46. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
catch / last / able to / we / were / train / the.

47. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
didn't / you / drink / have to / much / yesterday / so.

48. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
ought to / bill / Robert / the electricity / pay / today.

49. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
better / we / find / a / should / job.

50. Составьте предложения с модальными глаголами, расставив слова в нужном порядке. Переведите получившиеся предложения.
too much / you / salt / and / eat / sugar / shouldn't.

Раздел 3. Профессионально-ориентированный иностранный язык
Контролируемые ИДК: УК-4.1 УК-4.3

Тема 3.2. Моя специальность: История изучаемой науки и видные ученые

Форма контроля/оценочное средство: Контрольная работа

Вопросы/Задания:

1. Translate the text

A different approach to producing cadastral maps is through the use of stereo-plotting machines. These may be used either to show the physical features which coincide or coexist with the legal boundaries or to locate points of detail that can be used as control for simple ground surveys. Cadastral maps can then be compiled from a combination of photogrammetric plotting of physical details that are visible from the air with simple graphical methods of survey to locate specific land parcel boundaries. The resulting product would then be to graphical standards of accuracy, that is to the equivalent of the thickness of a line drawn on the map.

Many countries, however, insist on numerical information for their cadastral surveys and this has resulted in separate topographic and cadastral mapping, leading to duplication of effort even within a national survey department. In urban areas, it is not uncommon to find that large scale topographic mapping has been produced photogrammetrically for the purposes of planning and general land management while cadastral plans of the same area have been compiled separately from independent ground surveys. This separation of function between cadastral and topographic surveying is symptomatic of the polarization that has taken place between advocates of ground and air surveys with a resulting lack of homogeneity in the data.

Photogrammetric techniques can be used to produce numerical coordinate data through the use of analytical stereo plotters or comparators. These produce coordinates for points on the air photographs from which the ground coordinates can be calculated. The accuracy of such coordinates depends upon the equipment used but can be similar to that achieved by ground survey - in Germany and Switzerland, for example, such techniques have been successfully used to revise cadastral maps. The great advantage of air survey over ground survey is the speed and hence the enormous amount of time that can be saved.

In setting up a cadastral system there are obvious advantages in using photogrammetric techniques where the boundaries of parcels are visible from the air or where relatively cheap and stable marks can be emplaced of sufficient size that they can be seen clearly on the photographs. In the case of small areas and when adding to or revising an existing survey, the advantage of speed is much less, and must in any event be weighed against increased costs. The latter are due not only to the higher proportion of time spent in the air in relation to the amount of photography done, but also to the expense of setting up the necessary ground controls for a small job.

7. Оценочные материалы промежуточной аттестации

1 семестр, Зачет

Контролируемые ИДК: УК-4.1 УК-4.3

Вопросы/Задания:

1. Translate the text

The flag of the UK is known as the Union Jack. It has its history. It all began in 1603 when Scotland was joined to England and Wales. The flag is made up of 3 crosses. The upright cross is the Cross of St. Jeorge the patron saint of England. The white diagonal cross is the cross of St. Andrew, the patron saint of Scotland. The red diagonal cross is the cross is the cross of St. Patrick, the patron saint of Ireland. All of them are on the blue background. The national anthem is . The national currency is pound. Geographically the island of Great Britain is subdivided into 2 main regions: Lowland Britain and Highland Britain. Lowland Britain comprises southern and eastern England. Highland Britain consists of Scotland, most of Wales, the Pennines (or the Pennine Chain) and the Lake District. The highest mountain top is Ben Nevis in Scotland. The chief rivers of Great Britain are: the Severn, separating England and Wales, the Thames (the longest and the deepest one). The swiftest flowing river is the Spray. Also the Tweed is famous (the woolen fabric is made here). Every country in the UK has its own national emblem. The red rose is the national emblem of England, the thistle is the national emblem of Scotland, the daffodils and the leek are the emblems of Wales, and the shamrock (a kind of clover) is the emblem of Ireland.

2. Translate the text

The United Kingdom is a constitutional monarchy. It has a monarch - a King or a Queen. The present British monarch is Queen Elizabeth the Second. She become Queen in 1952. The monarch has little power and can reign with the support of Parliament. British Parliament is the legislative body at the country. It consists of two Houses. The House of Commons and House of Lords. Parliament and the monarch have different roles in the Government of the country. In reality, the House of Commons has truth power. It introduces new bills. Then they go to the House of Lords for approval. The functions of the Queen are: to open the sessions of the Parliament, to head the commonwealth, to be Commander-in-Chief, to declare the war, to make peace. The house of commons is made up of 650 elected knows of members of parliament. The party which has the majority of suits in the Government and its leader usually becomes prime minister. The prime minister forms his or her Cabinet Ministers. The chairman of the House of Commons is the Speaker. The chairman of the House of Lords is the Lord Chancellor. He sits on a special place, which is called the woolsack. It means that wool made England rich. The members of the House of Lords are not elected, there are live peers. There are several political parties in Great Britain. They are the Conservative, the Liberal, the Labor, the Social Democratic and the Communist parties. Prime minister of the country Boris Johnson is leader of the Conservative Party.

3. Translate the text

Siberia, in the north of Russia, is one of the coldest, harshest places on earth. Famed for its inhospitable climate, it is also mineral-wealthy and unexploited – a true frontier region. Although it has attracted mining companies for decades, the challenging landscape and conditions have meant they have only just begun to scratch the surface of the area's potential.

This could now be changing; as climate change leads to warmer temperatures, ice and permafrost are melting and potentially easing the mining process. The mining sector is the second biggest contributor to GDP in Russia, and is expected to continue to play an important role in its economy.

Mining in Siberia grew exponentially during the 20th century, as successive governments and leaders sought to take advantage of it. "The Siberian region is rich in minerals including coal, gold, diamond and iron ore, " says Globaldata analyst Alok Shukla. "Coal is largely extracted from Kemerovo, Krasnoyarsk Krai, Sakha (Yakutia), Republic of Khakassia, and Irkutsk Oblast. Gold originates mainly from Krasnoyarsk Krai and Irkutsk Oblast."

Russia is responsible for 7% of global aluminium production, and 95% of this takes place in Siberia. It is home to Russia's largest coal mine, the Arshanovsky pit in the Khakassia Republic which opened in 2015. When at full capacity it is expected to produce 10 million tonnes of coal, and there

are already plans to expand it further. Siberia and the Far East also hold 84% of Russia's known gold reserves.

But much remains unexplored or inaccessible in Siberia still, leaving the true mineral wealth of the region uncertain. In 2016, a mineral was discovered in Siberia unlike any ever found naturally occurring on earth. Instead it appears to be similar to lab-grown metal-organic frameworks. Such discoveries highlight the potential of a region so long hidden under ice and thick forests.

4. Translate the text

In recent years, climate change has been a much talked about issue, with many debates over its possible impact on the world, and some even going so far as to question its very existence. However, with the undeniable increase in greenhouse emissions on Earth, there can be no doubt that the earth is becoming warmer.

So what exactly does this mean for the future of our planet? In chilly places like the UK, we may think to ourselves: 'Finally, warmer weather!' But global warming will in fact cause extreme weather conditions, meaning that our winters would be even colder than they are now. More than that, warmer temperatures will lead to the melting of ice in the north and south poles, which in turn will lead to rising sea levels across the globe. This is particularly troubling for low coastal regions such as Florida in the USA which would be among the first to be flooded, along with many islands around the world, including the United Kingdom. In 1000 years or so, all these places and more will be submerged underwater.

So where will be able to live? Unless we can find a way to evolve into mermaids and mermen, which doesn't look promising, the only solution is to move elsewhere. There will be little choice left once a large proportion of the land is lost to the sea, and other remaining places will be so hot that they will be absolutely impossible to survive in. It is possible, then, that the once frozen poles of the Arctic and Antarctica will be suitable enough to live in, having melted its ice and warmed up.

It's a scary thought to imagine such devastation on Earth. Perhaps if people start to realise how their actions now can have such a profound impact on future generations, they will change their attitude and start to think more about caring for the environment, in order to save it.

5. Translate the text

Inland Weather in Wales

The higher you get in Wales, the colder and wetter it gets. And as you move away from the coasts, Wales is quilted with river valleys separated by increasingly higher hills. The Brecon Beacons in south Wales, are softly rolling but enormous, windswept hills where winter temperatures below freezing and snowfalls are not uncommon. Further north, in the inland mountains of Snowdonia National Park, heavy precipitation can be extreme. One mountain peak, Crib Goch, may be the wettest place in the entire country with an astonishing 176 inches of rainfall annually.2 And on the highest peaks, it snows a great deal.

Mount Snowdon, at 3, 560 feet and the highest U.K. mountain south of Scotland, can experience snowfall from October to May.

Snowfall at lower altitudes is rare, with an average of only 10 days a year with snow lying on the ground in the south and west Wales. On the other hand, the mountains of Snowdonia average 30 days a year with snowfall lying on the ground.

Autumn and Winter in Wales

In September, temperatures linger in the 60s but fall away rapidly through October and November into the high 40s. January and February are the coldest months with temperatures hovering around freezing or slightly above in higher areas and in the high 40s along the coast. Temperatures at night are usually 10 to as much as 15 degrees Fahrenheit colder depending on where you are in the country.

October through January are the wettest months. Rain tends to fall in short, sharp and very heavy showers. November is particularly squally with rain accompanied by gusty winds

6. Translate the text

Scotland is a country in the north of Great Britain. It is a part of the United Kingdom. Scotland is divided into three natural regions: the Southern Uplands, the Central Lowlands and the Highlands and islands. A lot of places in Scotland are a natural paradise, still untouched by man.

The capital of Scotland is Edinburgh, well known for its castle. Glasgow is the industrial capital of

Scotland. It is the third largest city in Great Britain. The typical products of Scotland are timber, whisky, salmon. Golf is the Scottish natural sport and it seems to have originated in this country.
Scotland is also the land of myths and mysteries; every castle has its ghost. Glamis Castle is said to have nine of them. And of course everyone knows about the Loch Ness Monster. 'Nessie" is said to be about six meters long, with a long, thin neck. The first report of the monster in Loch Ness was in 565 A.D. Since 1934, thousands of people claimed to they had seen the monster. Scientists have investigated the Loch and taken pictures but no scientific explanation of the mystery has been given.
Scotland is the north part of Great Britain. Five million people live in Scotland. Edinburgh is the capital of Scotland.

7. Translate the text

The London Eye, or the Millennium Wheel, is a cantilevered observation wheel on the South Bank of the River Thames in London. It is Europe's tallest cantilevered observation wheel, and is the most popular paid tourist attraction in the United Kingdom with over 3 million visitors annually. It has made many appearances in popular culture.
The structure is 135 metres (443 ft) tall and the wheel has a diameter of 120 metres (394 ft). When it opened to the public in 2000 it was the world's tallest Ferris wheel. Its height was surpassed by the 167 metres (548 ft) High Roller (Las Vegas) in 2014. Supported by an A-frame on one side only, unlike the taller Nanchang and Singapore wheels, the Eye is described by its operators as "the world's tallest cantilevered observation wheel".
The London Eye used to offer the highest public viewing point in London until it was superseded by the 245-metre-high (804 ft) observation deck on the 72nd floor of The Shard, which opened to the public on 1 February 2013.
In March 2020, the London Eye celebrated its 20th birthday by turning several of its pods into experiences themed around London, in partnership with its sponsor lastminute.com. The special experiences included a pub in a capsule, a west end theatre pod and a garden party with flower arrangements to represent the eight London Royal parks.

8. Translate the text

The Shard, located in London, is one of the most iconic skyscrapers in the United Kingdom and a prominent feature of the city’s skyline. Completed in 2012, it was designed by the renowned architect Renzo Piano and stands at a height of 310 meters (1, 016 feet), making it the tallest building in the UK and the fifth tallest in Europe. The Shard's unique design resembles a shard of glass, with its tapering form and reflective façade that changes appearance with the weather and time of day.
The construction of The Shard began in 2009 and was part of a larger redevelopment project for London Bridge Station and its surrounding area. The building consists of 95 floors, with a mix of office space, restaurants, a hotel, and residential apartments. The top floors house an observation deck known as "The View from The Shard, " which offers breathtaking panoramic views of London and beyond, attracting millions of visitors each year.
One of the most notable features of The Shard is its innovative use of glass. The façade is made up of 11, 000 glass panels that create a shimmering effect, allowing natural light to flood the interior spaces while providing stunning views for those inside. The building is also designed with sustainability in mind; it incorporates energy-efficient systems and has achieved a BREEAM rating for its environmental performance.
The Shard has become a symbol of modern London and is often featured in films, television shows, and promotional materials for the city. Its presence has also spurred further development in the surrounding area, contributing to London's status as a global financial hub.
In addition to its architectural significance, The Shard has played host to various cultural events and exhibitions since its opening. It has become a popular venue for corporate events, weddings, and private functions due to its stunning views and luxurious amenities.
Overall, The Shard represents not only an architectural achievement but also a testament to London's ongoing evolution as a vibrant metropolis. Its striking design and multifunctional use make it an essential part of the city's landscape and an

9. Translate the text

London’s Zero Carbon Target: A Pathway to a Sustainable Future

As one of the world's leading cities, London is at the forefront of addressing climate change and environmental sustainability. The Greater London Authority (GLA) has set an ambitious target to achieve net-zero carbon emissions by 2030. This goal reflects a commitment to creating a cleaner, healthier, and more sustainable urban environment for current and future generations.

Understanding the Zero Carbon Target

The zero carbon target means that London aims to balance the amount of greenhouse gases emitted with the amount removed from the atmosphere. This involves reducing emissions across various sectors, including transportation, buildings, energy production, and waste management. The target is not just about reducing carbon footprints but also about fostering resilience against climate impacts.

To achieve its zero carbon goal, London is implementing strategies across several key areas:

Energy Efficiency in Buildings: A significant portion of London's emissions comes from buildings. The GLA is promoting retrofitting existing structures to improve energy efficiency and encouraging new developments to meet stringent sustainability standards. Initiatives include the London Plan, which mandates higher energy performance standards for new buildings.

Renewable Energy Transition: Increasing the use of renewable energy sources is crucial for reducing carbon emissions. London aims to expand solar energy installations, wind power projects, and other renewable technologies. The city is also exploring community energy schemes that empower residents to generate and share renewable energy.

Sustainable Transport: Transportation is another major contributor to London's carbon footprint. The city is investing in public transport infrastructure, expanding cycling networks, and promoting electric vehicles (EVs). Initiatives like the Ultra Low Emission Zone (ULEZ) aim to reduce air pollution and encourage cleaner modes of transport.

Waste Management: Reducing waste and increasing recycling rates are essential components of London's sustainability strategy. The city is working towards a circular economy model that minimizes waste generation and maximizes resource recovery through recycling and composting programs.

Innovation and Technology

London recognizes that innovation plays a critical role in reaching its zero carbon goal. The city is investing in smart technologies that enhance energy efficiency and reduce emissions. This includes smart grids for better energy management, data analytics for optimizing transport systems, and digital platforms that facilitate sustainable practices among residents.

London's zero carbon target represents a bold vision for a sustainable future—a future where economic growth does not come at the expense of environmental health. By prioritizing energy efficiency, renewable energy adoption, sustainable transport solutions, waste reduction strategies, community engagement, and technological innovation, London aims to lead by example in the global fight against climate change. Achieving this ambitious goal will not only benefit the environment but also enhance the quality of life for all Londoners by creating a cleaner, greener city for generations to come.

10. Translate the text

The UK Climate: Challenges and Opportunities

The climate of the United Kingdom is characterized by its temperate maritime conditions, which result in relatively mild temperatures, moderate rainfall, and a lack of extreme weather events compared to many other regions. However, the UK is not immune to the impacts of climate change, which pose significant challenges to its environment, economy, and society. Understanding the current climate dynamics and the implications of climate change is crucial for developing effective strategies for mitigation and adaptation.

The UK experiences four distinct seasons, with average temperatures ranging from about 1°C (34°F) in winter to 20°C (68°F) in summer. Rainfall is distributed fairly evenly throughout the year, with some regions, particularly in the west and north, receiving significantly more precipitation than others. The climate varies across the country:

Southern England: Generally warmer and drier, with milder winters.

Northern England and Scotland: Cooler temperatures and higher rainfall.

Coastal Areas: Influenced by maritime conditions, leading to milder winters but also increased vulnerability to storms and flooding.

The effects of climate change are becoming increasingly evident in the UK:
Rising Temperatures: Average temperatures have increased by approximately 1°C since the late 19th century. This trend is expected to continue, leading to hotter summers and milder winters.
Increased Rainfall and Flooding: While overall rainfall may not significantly increase, extreme weather events are becoming more frequent. Heavy rainfall can lead to flooding, particularly in urban areas with inadequate drainage systems.
Sea Level Rise: Coastal areas are at risk due to rising sea levels caused by melting ice caps and thermal expansion of seawater. This threatens communities, infrastructure, and ecosystems along the coast.
Biodiversity Loss: Changing climates can disrupt ecosystems and habitats, leading to shifts in species distribution and increased risks for native wildlife.
Climate Adaptation Strategies: The government is developing strategies to adapt to climate impacts through improved infrastructure resilience, flood defenses, and sustainable land management practices.
Investment in Renewable Energy: The UK has made significant strides in transitioning to renewable energy sources such as wind (both onshore and offshore), solar power, and biomass. This shift aims to reduce reliance on fossil fuels and lower carbon emissions.
Local communities play a vital role in addressing climate change. Initiatives such as community-led renewable energy projects, tree planting campaigns, and local sustainability programs empower residents to take action at a grassroots level. Public awareness campaigns also aim to educate citizens about their carbon footprints and encourage sustainable practices.
The UK's climate presents both challenges due to the impacts of climate change and opportunities for innovation towards a sustainable future. By committing to ambitious targets like net-zero emissions, investing in renewable energy sources, engaging communities in sustainability efforts, and adapting infrastructure for resilience against extreme weather events, the UK aims not only to mitigate its own environmental impact but also to serve as a global leader in addressing one of humanity's most pressing issues—climate change. As these efforts continue to evolve, they will shape the future landscape of both the environment and society across the nation.

11. Translate the text

The Population of the United Kingdom: Trends and Dynamics
The population of the United Kingdom (UK) is a dynamic and diverse entity, reflecting a rich tapestry of cultures, ethnicities, and histories. As of 2023, the estimated population stands at approximately 67 million people, making the UK one of the most populous countries in Europe. Understanding the demographic trends and characteristics of the UK population is essential for addressing social, economic, and political challenges.
The UK is characterized by its multicultural society. The population includes a wide range of ethnic groups, with White British being the largest demographic, followed by significant communities of South Asian, Black, Mixed, and other ethnic backgrounds. Major cities like London, Birmingham, Manchester, and Leicester are particularly known for their cultural diversity. London alone is home to over 300 languages spoken by its residents.
The UK has experienced fluctuating population growth rates over the years. Following a period of steady growth in the early 21st century, recent trends indicate a slowdown in growth due to various factors such as declining birth rates and changes in immigration patterns. The fertility rate in the UK has fallen below the replacement level of 2.1 children per woman, leading to concerns about an aging population.
One of the most significant demographic challenges facing the UK is its aging population. Advances in healthcare and living standards have contributed to increased life expectancy, which currently averages around 81 years. As a result, the proportion of older adults (aged 65 and over) is rising rapidly. This shift presents challenges for healthcare services, pensions, and social care systems as they adapt to meet the needs of an older demographic.
Migration has played a crucial role in shaping the UK’s population dynamics. Historically a destination for immigrants seeking better opportunities, recent years have seen changes in migration patterns due to political events such as Brexit and global crises like the COVID-19 pandemic. While net migration has fluctuated, it remains a vital component of population growth and contributes to workforce diversity.

The population of the United Kingdom is characterized by its diversity and complexity. As it navigates challenges such as an aging demographic and changing migration patterns, understanding these dynamics will be crucial for shaping effective policies that promote social cohesion and economic stability. By embracing its multicultural identity while addressing regional disparities and demographic shifts, the UK can work towards a future that benefits all its residents.

12. Translate the text

The Economy of the United Kingdom: An Overview

The economy of the United Kingdom (UK) is one of the largest and most developed in the world, characterized by a diverse range of industries, a strong services sector, and a significant global presence. As of 2023, the UK economy is recovering from the impacts of the COVID-19 pandemic and navigating challenges such as inflation, supply chain disruptions, and geopolitical uncertainties.

The UK economy is primarily service-oriented, with services accounting for approximately 80% of GDP. Key sectors include finance, healthcare, education, retail, and tourism. London serves as a global financial hub, hosting numerous banks, investment firms, and insurance companies. The City of London and Canary Wharf are central to this financial activity, attracting international investment and talent.

Manufacturing remains an important part of the economy, contributing around 10% to GDP. The UK has a strong manufacturing base in industries such as aerospace, automotive, pharmaceuticals, and food production. Despite facing challenges from globalization and competition, British manufacturers continue to innovate and adapt to changing market demands.

The UK is a significant player in international trade. It exports goods and services worth hundreds of billions annually, with major trading partners including the European Union (EU), the United States, China, and Japan. Key exports include machinery, vehicles, pharmaceuticals, and financial services.

Post-Brexit trade dynamics have shifted as the UK navigates new trade agreements outside the EU framework. The government has sought to establish free trade agreements with various countries to enhance market access for British businesses.

Despite its strengths, the UK economy faces several challenges:

Inflation: Rising inflation rates have impacted consumer purchasing power and business costs. The Bank of England has responded with monetary policy adjustments to stabilize prices.

Supply Chain Disruptions: Global supply chain issues have affected various sectors, leading to delays in production and increased costs for businesses.

Geopolitical Uncertainties: Ongoing geopolitical tensions can influence trade relationships and economic stability.

The economy of the United Kingdom is marked by its resilience and adaptability in the face of challenges. With a strong services sector at its core and ongoing efforts towards innovation and sustainability, the UK continues to play a vital role in the global economic landscape. As it navigates post-pandemic recovery while addressing inflationary pressures and labor market dynamics, strategic policies will be essential for fostering growth that benefits all segments of society.

13. Translate the text

A Brief History of London

London, the capital city of England and the United Kingdom, boasts a rich and diverse history that spans over two millennia. Its origins can be traced back to the Roman period when it was established as Londinium around AD 43. The Romans recognized the strategic importance of the River Thames for trade and transportation, leading to the rapid growth of the settlement. By the end of the first century, Londinium had developed into a bustling town with a population of around 60, 000, complete with a forum, basilica, and defensive walls.

Following the decline of Roman rule in the early 5th century, London experienced a period of instability and fragmentation. The Anglo-Saxons began to settle in the area, and by the 9th century, it had become an important trading hub known as Lundenwic. However, this prosperity was threatened by Viking invasions, leading to the establishment of fortified settlements.

The Norman Conquest in 1066 marked a significant turning point in London's history. William the Conqueror built the Tower of London as a symbol of power and control over the city. The subsequent centuries saw London grow in importance as a political and economic center. The establishment of institutions such as Parliament and the Church further solidified its status.

The medieval period was marked by significant events such as the Black Death in 1348, which decimated London's population but also led to social and economic changes. The city continued to expand during the Tudor period, becoming a cultural hub under monarchs like Henry VIII and Elizabeth I.

The Great Fire of London in 1666 was another pivotal moment that reshaped the city. It destroyed much of medieval London but also provided an opportunity for reconstruction. Sir Christopher Wren played a crucial role in redesigning St. Paul's Cathedral and other buildings that defined London's skyline.

The Industrial Revolution in the 18th and 19th centuries transformed London into one of the world's largest cities. It became a center for finance, trade, and industry, attracting millions from rural areas and abroad. This rapid urbanization brought challenges such as overcrowding and pollution but also led to advancements in infrastructure, including railways and public transport.

The 20th century saw London endure two World Wars, which caused significant destruction but also fostered resilience among its inhabitants. Post-war reconstruction efforts led to modernization while preserving historical landmarks.

Today, London is a vibrant global city known for its cultural diversity, economic significance, and historical heritage. From its Roman roots to its status as a modern metropolis, London's history is a testament to its ability to adapt and thrive through centuries of change.

14. Translate the text

A Brief History of Moscow

Moscow, the capital city of Russia, has a rich and complex history that dates back to its founding in the 12th century. The city was first mentioned in historical records in 1147 when Prince Yuri Dolgoruky invited other princes to a feast. Initially, Moscow was a small settlement on the banks of the Moskva River, but its strategic location made it an important center for trade and politics.

In the late 13th century, Moscow began to rise in prominence under the leadership of Prince Ivan I, also known as Ivan Kalita. He managed to consolidate power and expand the territory, establishing Moscow as a significant principality. The city became the center of the Russian Orthodox Church after the fall of Kiev to the Mongols in 1240, further enhancing its influence.

The Mongol invasion in the 13th century led to several decades of domination known as the "Tatar Yoke." Despite this oppression, Moscow gradually gained strength and autonomy. By the late 15th century, under Grand Prince Ivan III (Ivan the Great), Moscow successfully overthrew Mongol rule and expanded its territory significantly. Ivan III also initiated major construction projects, including the Kremlin's stone walls and towers, which still stand today.

The 16th century saw the rise of Ivan IV (Ivan the Terrible), who was crowned as Russia's first tsar in 1547. His reign marked both expansion and turmoil; while he expanded Russian territory into Siberia, his later years were characterized by paranoia and violence, leading to a period of instability after his death in 1584.

The Time of Troubles (1598-1613) followed, marked by political chaos and foreign intervention. This period ended with the establishment of the Romanov dynasty in 1613, which would rule Russia for over three centuries. Under Peter the Great in the late 17th and early 18th centuries, Moscow faced competition from St. Petersburg as a political center but remained culturally significant.

The 19th century brought significant changes with industrialization and social upheaval. The Decembrist revolt in 1825 highlighted growing discontent among Russian elites. The city also played a crucial role during events such as Napoleon's invasion in 1812 when much of Moscow was burned to prevent French forces from using it.

The early 20th century was marked by revolutionary fervor. The Bolshevik Revolution in 1917 led to significant political changes; Moscow became the capital of Soviet Russia and later the Soviet Union. Under communist rule, extensive urban development transformed Moscow into a symbol of Soviet power.

After World War II, Moscow emerged as a global superpower's capital during the Cold War era. The city continued to grow economically and culturally despite facing challenges such as political repression.

With the dissolution of the Soviet Union in 1991, Moscow underwent significant transformations as Russia transitioned towards a market economy. Today, it stands as a vibrant metropolis known for its

rich history, diverse culture, and economic significance on both national and global stages.

15. Translate the text

Three Famous Places in London

London, a city steeped in history and culture, is home to numerous iconic landmarks. Among them, the Tower of London, Buckingham Palace, and the British Museum stand out as must-visit destinations that reflect the city's rich heritage.

1. The Tower of London

The Tower of London, a UNESCO World Heritage Site, is one of the most famous historical landmarks in the city. Founded by William the Conqueror in 1066, this imposing fortress has served various roles throughout its history, including royal palace, prison, and treasury. The Tower is perhaps best known for housing the Crown Jewels, a stunning collection of royal regalia that includes crowns, scepters, and other ceremonial items. Visitors can explore its medieval architecture, learn about its storied past through guided tours led by the Yeoman Warders (commonly known as Beefeaters), and hear tales of intrigue and imprisonment associated with figures like Anne Boleyn and Sir Thomas More.

2. Buckingham Palace

Buckingham Palace serves as the official residence of the British monarch and is an enduring symbol of the British monarchy. Originally built in 1703 as a townhouse for the Duke of Buckingham, it became a royal residence in 1837 when Queen Victoria ascended to the throne. The palace features 775 rooms and is surrounded by beautiful gardens. One of its most popular attractions is the Changing of the Guard ceremony, which takes place daily during summer and every other day during winter. Visitors can also tour the State Rooms during certain months when they are open to the public, offering a glimpse into royal life and opulence.

3. The British Museum

The British Museum is one of the world's oldest and most comprehensive museums dedicated to human history and culture. Established in 1753, it houses an extensive collection of over eight million works from various civilizations across the globe. Highlights include the Rosetta Stone, which was key to deciphering Egyptian hieroglyphs; the Elgin Marbles from the Parthenon; and mummies from ancient Egypt. The museum's architecture is equally impressive, featuring a stunning glass-roofed Great Court that provides a modern contrast to its historic galleries. Admission to the museum is free, making it accessible to millions who come to explore its vast array of artifacts.

16. Translate the text

The Center of London: A Vibrant Hub of Culture and History

The center of London is a bustling metropolis that serves as the heart of the United Kingdom's capital. This area is not only a financial powerhouse but also a cultural epicenter, rich in history and diversity. Spanning several boroughs, including Westminster and the City of London, the central area is home to iconic landmarks, world-class museums, and vibrant neighborhoods.

One of the most recognizable features of central London is its historic architecture. The Houses of Parliament, with the iconic Big Ben (now known as the Elizabeth Tower), stands majestically along the River Thames. This Gothic Revival masterpiece is not only a symbol of British democracy but also a UNESCO World Heritage Site. Nearby, Westminster Abbey has been the site of royal ceremonies for centuries, including coronations and weddings, making it a significant religious and historical landmark.

Just a short walk away lies Trafalgar Square, a lively public space that commemorates Admiral Nelson's victory at the Battle of Trafalgar. The square is adorned with the impressive Nelson's Column and is surrounded by notable institutions such as the National Gallery, which houses an extensive collection of European paintings. This area often hosts events and gatherings, making it a focal point for both locals and tourists.

Shopping enthusiasts flock to Oxford Street, one of Europe's busiest shopping streets, featuring over 300 shops ranging from high-street brands to luxury boutiques. Nearby Regent Street offers a more upscale shopping experience with its elegant architecture and flagship stores. For those seeking a more eclectic vibe, Covent Garden provides a mix of shops, street performances, and dining options in a charming setting.

Cultural experiences abound in central London. The West End is renowned for its theaters

showcasing world-class productions ranging from classic plays to contemporary musicals. Visitors can enjoy everything from Shakespearean dramas to modern hits like "The Lion King" or "Hamilton." The area's vibrant nightlife also includes an array of pubs, bars, and restaurants offering diverse cuisines from around the globe.

Central London is well-connected by an extensive public transport system that includes buses and the iconic London Underground (the Tube). This accessibility makes it easy for visitors to explore various neighborhoods such as Soho, known for its lively atmosphere and nightlife; Chinatown, with its authentic Asian cuisine; and Southbank, which offers stunning views along the Thames River.

In addition to its historical significance and cultural offerings, central London is also home to green spaces like Hyde Park and St. James's Park. These parks provide a tranquil escape from the urban hustle and bustle where visitors can relax or enjoy outdoor activities.

In summary, the center of London is a dynamic blend of history, culture, shopping, and entertainment. Its iconic landmarks tell stories of Britain's past while contemporary attractions reflect its vibrant present. Whether you're exploring historic sites or indulging in modern experiences, central London offers something for everyone—a true testament to its status as one of the world's great cities.

17. Translate the text

The Center of Moscow: A Dynamic Blend of History and Modernity

The center of Moscow is a vibrant and bustling area that serves as the heart of Russia's capital. Known for its rich history, stunning architecture, and cultural significance, this part of the city attracts millions of visitors each year. The blend of historical landmarks and modern developments creates a unique atmosphere that reflects both the past and the present.

At the core of Moscow lies the iconic Red Square, one of the most famous squares in the world. This UNESCO World Heritage Site is surrounded by remarkable structures, including the colorful St. Basil's Cathedral with its distinctive onion domes, which has become a symbol of Russia itself. The square also features the imposing walls of the Kremlin, a fortified complex that serves as the official residence of the President of Russia. The Kremlin is home to several palaces and cathedrals, showcasing stunning examples of Russian architecture and art.

Adjacent to Red Square is Lenin's Mausoleum, where visitors can pay their respects to the founder of the Soviet Union. The mausoleum stands as a reminder of Russia's tumultuous history and its impact on contemporary society. Nearby, GUM (Glavny Universalny Magazin), a historic department store with an elegant glass roof, offers a luxurious shopping experience with high-end boutiques and cafes.

Moscow's central area is also known for its impressive metro system, often referred to as one of the most beautiful in the world. Many metro stations are adorned with intricate mosaics, chandeliers, and sculptures that reflect Soviet-era art and design. Stations like Komsomolskaya and Mayakovskaya are particularly noteworthy for their stunning aesthetics.

Cultural experiences abound in central Moscow. The Bolshoi Theatre is renowned for its ballet and opera performances, attracting art lovers from around the globe. Just a short walk away lies Tverskaya Street, one of Moscow's main thoroughfares lined with shops, restaurants, and theaters. This bustling street epitomizes modern Moscow while still retaining elements of its historical charm.

For those seeking green spaces amidst the urban landscape, Gorky Park offers a refreshing escape. This expansive park features walking paths, open-air cafes, and recreational activities such as cycling and rollerblading. It serves as a popular gathering place for locals and tourists alike.

The center of Moscow is also home to numerous museums that showcase Russian art and history. The State Tretyakov Gallery houses an extensive collection of Russian fine art from various periods, while the Pushkin State Museum of Fine Arts features works from European masters.

As night falls, central Moscow transforms into a lively hub filled with nightlife options ranging from trendy bars to traditional Russian restaurants offering local cuisine. The illuminated skyline adds to the city's charm as visitors enjoy evening strolls along the Moskva River or through historic streets.

18. Translate the text

The Moscow Kremlin: A Symbol of Power and History

The Moscow Kremlin is one of the most iconic landmarks in Russia and serves as a powerful symbol of the nation's history and political authority. Located in the heart of Moscow, this fortified complex has been the center of Russian power for centuries, housing the offices of the President of Russia and

serving as a UNESCO World Heritage Site.
The Kremlin's history dates back to the 12th century when it was established as a wooden fort. Over the years, it evolved into a grand stone fortress, with its walls and towers constructed from red brick in the late 15th century under the direction of Italian architects. The Kremlin's imposing walls stretch for over two kilometers and are punctuated by 20 towers, each with its own unique design and historical significance. The most famous of these is the Spasskaya Tower, adorned with a clock that chimes on the hour and serves as a symbol of Moscow itself.
Within the Kremlin's walls lies a treasure trove of architectural marvels and historical sites. The Cathedral Square is at its heart, surrounded by three magnificent cathedrals: the Assumption Cathedral, where Russian tsars were crowned; the Archangel Cathedral, which houses the tombs of many Russian princes; and the Annunciation Cathedral, known for its stunning frescoes. These cathedrals showcase exquisite examples of Russian Orthodox architecture and art.
Another significant structure within the Kremlin is the Grand Kremlin Palace, which was built in the 19th century as a residence for Russian tsars. Today, it serves as an official residence for the President and hosts important state ceremonies. The palace features opulent interiors adorned with lavish decorations that reflect Russia’s imperial past.
The State Armory Museum (Оружейная Палата) is another highlight within the Kremlin complex. It houses an impressive collection of royal artifacts, including crowns, thrones, ceremonial weapons, and carriages used by Russian monarchs. Visitors can explore exhibits that showcase Russia’s rich cultural heritage and craftsmanship.
The Kremlin is not only a historical site but also an active political center. It has witnessed significant events throughout Russian history, from grand coronations to pivotal political decisions. Today, it remains a symbol of national pride and authority.
Surrounding the Kremlin are beautiful gardens and parks that offer stunning views of this historic site. The Alexander Garden features well-maintained pathways, fountains, and monuments commemorating key figures in Russian history. Visitors can stroll through these green spaces while enjoying picturesque views of the Kremlin’s towers.
Access to the Kremlin is available to tourists who wish to explore its rich history firsthand. Guided tours provide insights into its architectural wonders and historical significance while allowing visitors to appreciate its beauty up close.

19. Translate the text

The Tower of London: A Fortress of History
The Tower of London, one of the most famous landmarks in England, has a rich and complex history that spans over 1, 000 years. Founded by William the Conqueror in 1066 as part of the Norman Conquest, the Tower was originally built to assert his power over the newly acquired territory. The White Tower, its central structure, is an impressive example of Norman military architecture and served as a royal palace and fortress.
Throughout its history, the Tower has played various roles: it has been a royal residence, a treasury, an armory, and even a menagerie. Its strategic location on the banks of the River Thames made it an essential defensive stronghold for London. The Tower's walls have witnessed numerous significant events, including royal ceremonies and political intrigue.
One of the most notorious aspects of the Tower's history is its use as a prison. Over the centuries, it has housed many high-profile prisoners, including Anne Boleyn, Thomas More, and Lady Jane Grey. The executions that took place within its walls have contributed to its dark reputation. Anne Boleyn was famously executed on Tower Green in 1536; her ghost is said to haunt the grounds to this day.
The Tudor period marked a significant transformation for the Tower. Under King Henry VIII, it became a symbol of royal power and authority. The infamous Beefeaters (Yeoman Warders) were established during this time to guard the Tower and its prisoners. Today, they serve as tour guides and custodians of its rich history.
In addition to its role as a prison, the Tower has also been a place of great ceremony. It is home to the Crown Jewels of England, which include some of the most magnificent regalia in the world. These treasures are displayed in a secure exhibition within the Tower and attract millions of visitors each year.
The 17th century saw further changes as the Tower's military significance diminished. It became more associated with ceremonial functions than with defense. However, it remained an important

symbol of monarchy and national identity.
In 1840, Queen Victoria designated the Tower as a historical monument rather than an active fortress or prison. This shift marked the beginning of its transformation into a major tourist attraction. Restoration efforts were undertaken to preserve its structures and artifacts for future generations.
Today, the Tower of London is recognized as a UNESCO World Heritage Site and remains one of London's most visited attractions. Visitors come from around the globe to explore its storied past through guided tours that reveal tales of intrigue, betrayal, and royal grandeur.
The annual Ceremony of the Keys continues to be performed each night at precisely 9:53 PM—a tradition that dates back centuries—symbolizing that all gates are locked for security

20. Translate the text

The British Museum: A Chronicle of Human History
The British Museum, located in the heart of London, is one of the world's most renowned cultural institutions, dedicated to human history, art, and culture. Established in 1753, it was founded on the collections of Sir Hans Sloane, a physician and naturalist who bequeathed his vast array of artifacts to the nation. The museum opened its doors to the public in 1759, making it one of the first public museums in the world.
From its inception, the British Museum aimed to make knowledge accessible to all. Its founding principle was to collect and preserve objects that represented the diversity of human experience. The museum's original collection included around 71, 000 items, ranging from antiquities to natural specimens. Over time, this collection has expanded exponentially and now encompasses over eight million objects.
The museum's architecture is as impressive as its collections. The original building was designed by Sir Robert Smirke in a neoclassical style and features the iconic Great Court (Большой Двор), which was completed in 2000. The Great Court houses the stunning glass-roofed Reading Room and serves as a central hub for visitors.
One of the most significant aspects of the British Museum is its vast collection of artifacts from ancient civilizations. Among its most famous exhibits are the Rosetta Stone, which played a crucial role in deciphering Egyptian hieroglyphs; the Elgin Marbles from the Parthenon in Athens; and an extensive collection of Egyptian mummies. These items not only showcase artistic achievement but also provide invaluable insights into ancient cultures.

Throughout its history, the museum has been at the center of debates regarding cultural heritage and repatriation. Many artifacts were acquired during periods of colonial expansion, leading to ongoing discussions about their rightful ownership. The museum has faced criticism for holding items that some argue should be returned to their countries of origin. In response, it has engaged in dialogue with various nations regarding cultural restitution while emphasizing its role in preserving global heritage.
The British Museum has also played a significant role in education and research. It offers numerous programs for schools and communities, aiming to foster understanding and appreciation for world cultures. Scholars from around the globe utilize its extensive library and archives for research purposes.
In addition to its permanent collections, the museum hosts temporary exhibitions that explore specific themes or cultures in greater depth. These exhibitions often draw on loans from other institutions or private collections, further enriching visitors' experiences.
Today, the British Museum attracts millions of visitors each year from all corners of the globe. It remains free to enter (though some special exhibitions may charge), reflecting its commitment to accessibility and public engagement with history and culture.

21. Look through the text and describe it briefly

Located in the north, west and east latitudes of the Northern Hemisphere, most of Russia is much closer to the North Pole than to the equator. Individual country comparisons are of little value in gauging Russia's enormous size and diversity. The country's 17.1 million square kilometers include one-eighth of the Earth's inhabited land area. Its European portion, which occupies a substantial part of continental Europe, is home to most of Russia's industrial and agricultural activity and is where, roughly between the Dnieper River and the Ural Mountains, the Russian Empire took shape. Russia

includes the entire northern portion of Asia.
From west to east, the country stretches from Kaliningrad to Ratmanov Island in the Bering Strait. This distance is roughly equivalent to the distance from Glasgow, Scotland, to Nome, Alaska. From north to south, the country ranges from the northern tip of the Russian Arctic islands at Franz Josef Land to the southern tip of the Republic of Dagestan on the Caspian Sea, spanning about 4, 500 kilometres of extremely varied, often inhospitable terrain.
Extending for 57, 792 kilometres, the Russian border is the world's longest.

22. Look through the text and describe it briefly

One can hardly find a park, a square or an open area in Washington without a monument or a memorial. The most impressive and the best-known ones are the Lincoln Memorial and the Washington Monument. There are some important museums in Washington where you can see all kinds of things: famous paintings and sculptures, the dresses of President's wives, the original of the Declaration of Independence, the largest blue diamond in the world, etc. There are 5 universities in Washington.
There are no skyscrapers in Washington, because they would hide the city's many monuments from view. No building in the city may be more than 40 meters tall. Thousands of tourists visit Washington every day. People from all parts of the United States come to see then- capital.
The Jefferson Memorial was built in memory of the third President of the USA, Thomas Jefferson, who was also the author of the Declaration of Independence. The memorial is surrounded by cherry-trees. The Lincoln Memorial devoted to the memory of the 16th President of the US, the author of the Emancipation Proclamation, which gave freedom to Negro slaves in America.

23. Look through the text and describe it briefly

Air pollution and climate change.
Problem: Overloading of the atmosphere and of ocean waters with carbon. Atmospheric CO2 absorbs and re-emits infrared-wavelength radiation, leading to warmer air, soils, and ocean surface waters - which is good: The planet would be frozen solid without this.
Unfortunately, there's now too much carbon in the air. Burning of fossil fuels, deforestation for agriculture, and industrial activities have pushed up atmospheric CO2 concentrations from 280 parts per million (ppm) 200 years ago, to about 400 ppm today. That's an unprecedented rise, in both size and speed. The result: climate disruption.
Carbon overloading is only one form of air pollution caused by burning coal, oil, gas and wood. The World Health Organization recently estimated that one in nine deaths in 2012 were attributable to diseases caused by carcinogens and other poisons in polluted air.
Solutions: Replace fossil fuels with renewable energy. Reforestation. Reduce emissions from agriculture. Change industrial processes.
The good news is that clean energy is abundant - it just needs to be harvested. Many say a 100 percent renewable-energy future is feasible with existing technology now.
But the bad news is that even though renewable energy infrastructure - solar panels, wind turbines, energy storage and distribution systems - are already widespread, and getting cheaper and more efficient all the time, experts say we're not applying them quickly enough to prevent catastrophic climate disruption. Barriers in policy and finance remain to be overcome.

24. Look through the text and describe it briefly

WE MUST PROTECT OUR ENVIRONMENT
Our country. Our environment. There are many big and small rivers, green forests, high mountains, lakes and seas in Russia. Our Earth is our home. I think people must take care of our Motherland. But the problem of pollution now is very important. There are some factors that increase the problem.
First of all, our plants and factories put their waste materials into water and atmosphere and pollute the environment. There are many kinds of transport in our cities. We can't ignore their effect on the environment, that is why we must pay attention to the protection of our nature and the health of the people.
Radiation. Now it has become one of the main problems. It is not good for health of people. Many people died from radiation some years ago in Chernobol. It was a tragedy. The other problem is an earthquake. We know some terrible earthquakes in Chile, Haiti, Japan. Our scientists try to forecast

earthquakes, then we can protect ourselves from them.

25. Look through the text and describe it briefly

KEY FEATURES OF THE GREEN ECONOMY

Simply put, a green economy is low-carbon, resource efficient, and socially inclusive. Some of it's key features include:

Abundant opportunities for good green jobs that pay a living wage.

A price on carbon, either through a cap-and-trade program or an economy-wide tax on carbon.

More efficient use of energy and other resources. For example, huge economic and environmental gains could be made if we had more energy efficient buildings and transportation.

Greater use of renewable resources, like wind and solar, instead of non-renewable resources, such as coal and oil.

Greener manufacturing which is resource efficient and doesn't use toxic chemicals

Proper value assigned to natural environments and ecosystems, in recognition of all the services the environment provides such as carbon sequestration, flood protection, and waste water treatment.

A robust recycling and reuse industry, with minimal waste sent to landfill.

26. Look through the text and describe it briefly

Deforestation.

Problem: Species-rich wild forests are being destroyed, especially in the tropics, often to make way for cattle ranching, soybean or palm oil plantations, or other agricultural monocultures.

Today, about 30 percent of the planet's land area is covered by forests - which is about half as much as before agriculture got started around 11, 000 years ago. About 7.3 million hectares (18 million acres) of forest are destroyed each year, mostly in the tropics. Tropical forests used to cover about 15 percent of the planet's land area; they're now down to 6 or 7 percent. Much of this remainder has been degraded by logging or burning.

Not only do natural forests act as biodiversity reserves, they are also carbon sinks, keeping carbon out of the atmosphere and oceans.

Solutions: Conserve of what's left of natural forests, and restore degraded areas by replanting with native tree species. This requires strong governance - but many tropical countries are still developing, with increasing populations, uneven rule-of-law, and widespread cronyism and bribery when it comes to allocating land use.

27. Look through the text and describe it briefly

WHAT IS THE GREEN ECONOMY?

Today, many people realize that it's not about the environment versus the economy, not a tradeoff between unemployment and pollution. It's not about picking one or the other.

We cannot choose between the environment and the economy. We need both.

This realization is at the heart of an emerging economic and environmental concept, often termed " the green economy."

It reflects a growing recognition that, on the one hand, the challenge of sustainability rests almost entirely in getting the economy right. Putting a price on carbon, valuing natural capital and ending perverse subsidies, among other things, are all vital to meaningful environmental reform.

And, on the other hand, if we wish to create a sustainable economy, we must pay more attention to the environment. Against a backdrop of climate change, resource scarcity, the massive loss of biodiversity and a variety of other environmental issues, business as usual is increasingly risky.

The green economy was initially driven by an environmental imperative, the recognition that climate change and ecological degradation threaten our future prosperity. But today, it is driven equally by opportunity, the recognition that a green economy opens up new possibilities for jobs and growth. As a recent report from the U.N. put it, "the greening of economies is not generally a drag on growth but rather a new engine of growth…a net generator of decent jobs…"

28. Look through the text and describe it briefly

Green Technology and Sustainable Mobile Phones

The rapid growth of the smartphone industry has raised environmental concerns, from excessive e-waste to high carbon emissions. However, modern green technology is transforming mobile phones into eco-friendly devices, promoting sustainability without compromising performance.

Eco-Friendly Materials

Many manufacturers now use recycled or biodegradable materials. For example, companies like Fairphone design modular phones with responsibly sourced metals and plastics, reducing environmental impact. Others, like Apple, have committed to using 100% recycled rare earth elements in their iPhones.

Energy Efficiency and Renewable Power

Smartphones now feature energy-efficient processors (e.g., ARM's big.LITTLE architecture) and low-power displays (OLED/LTPO). Additionally, companies are shifting to renewable energy for production. Samsung and Google have pledged to power data centers and factories with 100% renewable energy.

Longevity and Repairability

To combat e-waste, brands are extending device lifespans through software updates (e.g., 7+ years for Google Pixel) and modular designs. The Right to Repair movement has also pushed companies like Microsoft and Apple to provide repair guides and spare parts.

E-Waste Recycling Programs

Many tech giants now offer trade-in and recycling programs, recovering valuable materials from old devices. For instance, Apple's recycling robot, Daisy, disassembles iPhones to reclaim metals, reducing mining demand.

Solar and Kinetic Charging

Innovations like solar-powered cases (e.g., Solartab) and kinetic energy chargers are emerging, reducing reliance on grid electricity. Researchers are even exploring biodegradable batteries to minimize toxic waste.

Green technology is reshaping the mobile industry, making smartphones more sustainable. As consumers, supporting eco-conscious brands and recycling old devices can drive further progress toward a greener future.

29. Look through the text and describe it briefly

Waste Management and Green Technology: Paving the Way for a Sustainable Future

The rapid growth of industrialization and consumerism has led to an alarming increase in waste generation, posing severe threats to the environment and human health. However, advancements in green technology are revolutionizing waste management, offering innovative solutions to reduce, reuse, and recycle waste efficiently.

The Global Waste Crisis

Every year, the world generates over 2 billion tons of municipal solid waste, with plastic, electronic waste (e-waste), and food waste being major contributors. Landfills and incineration—traditional waste disposal methods—release harmful greenhouse gases (like methane and CO_2) and toxic chemicals, accelerating climate change and pollution.

Green Technology Solutions for Waste Management

1. Smart Recycling Systems

o AI-powered waste sorting robots (e.g., ZenRobotics) use machine learning to separate recyclables with high precision.

o Blockchain-based tracking ensures transparent recycling processes, reducing illegal dumping.

2. Waste-to-Energy (WtE) Technologies

o Biogas plants convert organic waste into renewable energy.

o Plasma gasification breaks down non-recyclable waste into clean syngas for electricity.

3. Circular Economy & Sustainable Materials

o Companies like TerraCycle upcycle hard-to-recycle waste into new products.

o Biodegradable packaging (e.g., Mushroom-based materials, seaweed plastics) replaces single-use plastics.

4. E-Waste Innovations

o Urban mining extracts precious metals (gold, lithium) from discarded electronics.

o Modular smartphones (e.g., Fairphone) reduce e-waste by enabling easy repairs.

5. Zero-Waste Initiatives

o Cities like San Francisco aim for zero waste through strict recycling/composting laws.

o Edible cutlery and reusable container programs cut down disposable waste.

Challenges and the Way Forward

Despite progress, challenges like high costs, lack of infrastructure, and low public awareness persist.

Governments and corporations must invest in:
• Extended Producer Responsibility (EPR) policies.
• Public education campaigns on waste segregation.
• Subsidies for green tech startups.
Green technology is transforming waste from an environmental burden into a resource. By adopting sustainable practices and supporting innovations, we can move toward a zero-waste future.

30. Look through the text and describe it briefly

Smart Homes and Low-Power Devices: Green Technology for Sustainable Living
As energy demands rise and environmental concerns grow, smart homes and low-power devices are emerging as key solutions for sustainable living. By integrating energy-efficient technologies with automation, modern households can significantly reduce electricity consumption, minimize waste, and lower carbon footprints.
Smart homes use IoT (Internet of Things) devices to optimize energy usage by:
• Automated lighting systems (e.g., motion sensors, smart bulbs like Philips Hue) that turn off when not needed.
• Smart thermostats (e.g., Nest, Ecobee) that learn user habits and adjust heating/cooling to save energy.
• Energy monitoring systems that track real-time electricity usage and suggest optimizations.
Low-Power Devices: Reducing Energy Waste
Advances in semiconductor technology have led to ultra-efficient electronics:
• Low-power processors (e.g., ARM Cortex-M for IoT) that extend battery life in smart sensors.
• Energy Star-certified appliances (refrigerators, washing machines) that consume 10–50% less power.
• Solar-powered smart gadgets (e.g., smart blinds, outdoor cameras) that rely on renewable energy.
Green Technology in Smart Homes
1. Energy Storage & Renewable Integration
o Home battery systems (e.g., Tesla Powerwall) store solar energy for nighttime use.
o Smart inverters optimize solar panel output, feeding excess power back to the grid.
2. AI-Driven Energy Management
o AI algorithms predict usage patterns and shift high-power tasks (e.g., EV charging) to off-peak hours.
3. E-Waste Reduction
o Modular smart devices (e.g., Framework Laptop) allow easy upgrades, reducing electronic waste.
o Companies like Apple use recycled materials in products like HomePod.
Smart homes and low-power devices exemplify how green technology can merge sustainability with convenience. By adopting these solutions, households can cut energy bills, reduce reliance on fossil fuels, and contribute to a zero-waste future.

31. Look through the text and describe it briefly

IoT and Ecology: Smart Technologies for a Sustainable Planet
The Internet of Things (IoT) is revolutionizing environmental conservation by enabling real-time monitoring, data-driven decision-making, and automated resource management. From smart agriculture to pollution control, IoT bridges technology and ecology to foster a greener future.
How IoT Supports Ecological Sustainability
Environmental Monitoring
IoT sensors track critical ecological parameters:
Air Quality: Networks of sensors (e.g., BreezoMeter) detect pollutants (CO_2, PM2.5) in cities.
Water Conservation: Smart meters monitor river levels, detect leaks, and prevent waste (e.g., Sensus AquaSense).
Wildlife Protection: GPS-enabled collars and acoustic sensors track endangered species and deter poaching.
Precision Agriculture
IoT optimizes farming while reducing environmental harm:
Soil Sensors measure moisture/nutrient levels, minimizing water/fertilizer use.
Drones & Smart Irrigation (e.g., CropX) analyze fields and deliver water only where needed.

Energy Efficiency & Smart Cities
Smart Grids balance renewable energy (solar/wind) usage across neighborhoods.
Waste Management: IoT-enabled bins (e.g., Enevo) signal collection trucks only when full, cutting fuel emissions.
Pollution & Disaster Control
Forest Fire Detection: Early-warning systems (e.g., Dryad Networks) use solar-powered sensors to detect wildfires.
Ocean Cleanup: Floating IoT drones (like The Ocean Cleanup's Interceptor) identify and collect plastic waste.
Future innovations may include:
Biodegradable IoT sensors powered by plant energy.
AI-powered ecology models predicting climate shifts.
IoT transforms passive ecological efforts into proactive, intelligent systems. By integrating smart technology with environmental science, we can combat climate change, conserve resources, and protect ecosystems more effectively.

32. Look through the text and describe it briefly

Modern Trends in Waste Management: Technology Driving Sustainability
As global waste generation continues to rise—exceeding 2.3 billion tons annually—innovative technologies and strategies are transforming waste management. From AI-powered sorting to circular economy models, modern trends focus on reducing landfill reliance, maximizing recycling, and converting waste into resources.
Smart Waste Collection & IoT
Sensor-Enabled Bins: IoT-connected trash bins (e.g., Bigbelly) monitor fill levels and optimize collection routes, reducing fuel use.
Blockchain Tracking: Ensures transparency in waste disposal and recycling chains (e.g., Plastic Bank's tokenized recycling).
AI and Robotics for Sorting
AI-Powered Systems: Machines like AMP Robotics use computer vision to identify and sort recyclables with 99% accuracy.
Waste-to-Resource Plants: Automated facilities separate metals, plastics, and organics for repurposing.
Circular Economy & Upcycling
Brand-Led Initiatives: Companies like Adidas (sneakers from ocean plastic) and IKEA (furniture from recycled materials) close the loop on waste.
Industrial Symbiosis: Factories exchange waste materials as raw inputs (e.g., using slag from steel production in cement).
Advanced Waste-to-Energy (WtE)
Plasma Gasification: Converts non-recyclable waste into clean syngas for electricity.
Biodegradable Waste Digesters: Systems like HomeBiogas turn food scraps into cooking fuel.
Zero-Waste Policies & Consumer Tech
Bans on Single-Use Plastics: Over 100 countries have restricted plastic bags/straws.
Apps for Waste Reduction: Platforms like Too Good To Go combat food waste by connecting users with surplus meals.
Challenges & Future Outlook
High Costs: Scaling advanced tech (e.g., AI sorting) requires investment.
Behavioral Change: Public education is critical to boost recycling participation.
E-Waste Surge: Fast-growing electronic waste demands better recycling tech.
Modern waste management blends technology, policy, and consumer action to turn trash into treasure. By adopting these trends, societies can cut pollution, conserve resources, and move toward a zero-waste future.

33. Look through the text and describe it briefly

Modern Trends in Ocean Cleaning: Innovative Solutions for a Plastic-Free Future
The world's oceans face an unprecedented pollution crisis, with 11 million metric tons of plastic entering marine ecosystems annually. Modern technologies and initiatives are revolutionizing ocean

cleaning, combining AI, robotics, and community-driven efforts to restore marine health.
Large-Scale Cleanup Systems
The Ocean Cleanup Project: Deploys Interceptor Barriers in rivers (capturing 80% of riverine plastic) and System 03 (a massive floating barrier cleaning the Great Pacific Garbage Patch).
Seabin Project: Floating trash collectors in marinas filter water 24/7, removing microplastics and oil.
AI-Powered Drones (e.g., Clear Blue Sea): Autonomous vessels identify and collect floating debris using machine learning.
Robotic Fish (e.g., WasteShark): Solar-powered aqua drones "eat" plastic waste in harbors.
Microplastic Filtration
StormX (by The Great Bubble Barrier): Uses air bubbles to trap microplastics in rivers before they reach oceans.
Filtering Washing Machines: New tech captures synthetic microfibers released during laundry cycles.
Bioremediation & Natural Solutions
Plastic-Eating Enzymes (e.g., PETase): Genetically modified bacteria break down PET plastic in seawater.
Oyster Reef Restoration: Natural filters improve water quality while stabilizing coastlines.
Policy and Community Action
UN Plastic Treaty: A global agreement to end plastic pollution by 2024.
#TeamSeas Initiative: Crowdfunded campaigns remove 1 pound of trash per $1 donated.
Challenges and Future Directions
Scale: Current efforts address <1% of ocean plastic; scaling tech is critical.
Funding: High costs for R&D and deployment require public-private partnerships.
Deep-Sea Waste: Most tech targets surface waste, but deep-sea pollution remains unresolved.
From robotic cleaners to international policies, modern ocean cleaning trends offer hope for reversing marine pollution. Success depends on technology, global cooperation, and individual action—because saving the oceans starts on land.

34. Look through the text and describe it briefly

Modern Trends in Air Cleaning: Innovative Solutions for Healthier Air
Air pollution remains a critical global challenge, contributing to 7 million premature deaths annually (WHO). As urbanization and industrialization intensify, cutting-edge technologies and sustainable strategies are emerging to purify the air we breathe. From smart filtration to carbon capture, modern air-cleaning innovations combine AI, biotechnology, and renewable energy to combat pollution.
• AI-Powered Purifiers: Devices like Dyson Pure Cool use sensors and machine learning to detect and neutralize pollutants (PM2.5, VOCs) in real time.
• HVAC Integration: Buildings now embed MERV-13 filters and UV-C light to sterilize airflow (e.g., Carrier's Healthy Buildings Program).
2. Carbon Capture and Utilization (CCU)
• Direct Air Capture (DAC): Plants like Climeworks' Orca in Iceland absorb CO_2 from the air and store it underground or repurpose it for fuel.
• Algae Bioreactors: Companies like Hypergiant use algae to convert CO_2 into oxygen and biomass.
3. Urban Green Infrastructure
• Smog-Eating Buildings: Coatings with titanium dioxide (e.g., Manuel Gea González Hospital, Mexico) break down pollutants when exposed to sunlight.
• Vertical Forests: Projects like Bosco Verticale (Milan) integrate thousands of plants into skyscrapers to absorb CO_2 and particulate matter.
4. Low-Emission Transportation
• EV Adoption: Electric vehicles and solar-powered charging stations reduce urban NOx and particulate emissions.
• Hydrogen-Powered Public Transit: Cities like Copenhagen deploy hydrogen buses emitting only water vapor.
5. Community and Policy Initiatives
• Air Quality Apps: Platforms like Plume Labs provide real-time pollution maps and personalized health advice.
• Global Bans on Combustion Engines: Countries like Norway and the UK plan to phase out gas/diesel cars by 2030.

Challenges and Future Innovations
• Energy Use: DAC and large-scale filters require renewable energy to stay sustainable.
• Equity: Low-income areas often lack access to advanced air-cleaning tech.
• Indoor Pollution: Rising focus on nanofiber filters and houseplants (e.g., peace lilies) to combat toxins at home.
Next-Gen Solutions:
• Nanotech Filters: Graphene-based membranes to trap ultrafine particles.
• Bioengineered Plants: Modified ivy (e.g., Neo P1) that absorbs 30% more pollutants.
From smart cities to bioreactors, modern air-cleaning trends are merging technology, nature, and policy to clear the skies. While challenges remain, these innovations offer a roadmap for a future where clean air is a universal right—not a privilege.

35. Look through the text and describe it briefly

Modern Trends in Renewable Energy: Powering the Future Sustainably
The global transition to renewable energy is accelerating, driven by climate urgency and technological breakthroughs. By 2030, renewables are projected to supply 40% of global electricity (IEA). From next-gen solar to green hydrogen, cutting-edge innovations are making clean energy more efficient, affordable, and accessible.
• Perovskite Solar Cells: Achieve 30%+ efficiency (vs. 22% for silicon) and work in low light. Companies like Oxford PV aim for commercial rollout by 2025.
• Agrivoltaics: Dual-use farms (e.g., France's Sun'Agri) combine crops with solar panels, boosting land productivity.
2. Wind Energy Innovations
• Floating Wind Turbines: Deployed in deep waters (e.g., Hywind Scotland), unlocking untapped offshore potential.
• Kite Power: Airborne wind energy systems (like SkySails) reduce material use by 90% compared to traditional turbines.
3. Green Hydrogen Breakthroughs
• Electrolyzer Efficiency: New tech (e.g., Hysata's capillary-fed electrolysis) cuts green hydrogen production costs by 30%.
• Industrial Applications: Steel (HYBRIT Project) and shipping (Maersk's methanol-powered vessels) pivot to hydrogen-based fuels.
4. Energy Storage Advancements
• Solid-State Batteries: Higher capacity and safety (e.g., QuantumScape) for grid and EV storage.
• Gravity Storage: Startups like Energy Vault use stacked blocks to store renewable energy mechanically.
5. AI and Smart Grids
• Predictive Maintenance: AI optimizes wind/solar farm output (e.g., GE's Digital Wind Farm).
• Virtual Power Plants (VPPs): Networks of home batteries (e.g., Tesla Powerwall) balance grid demand.
Challenges and Future Frontiers
• Supply Chain: Rare mineral shortages (e.g., lithium, cobalt) require recycling breakthroughs.
• Policy Gaps: Faster permitting and subsidies needed to scale projects.
• Energy Equity: Ensuring developing nations benefit from clean tech.
Emerging Solutions:
• Nuclear Fusion: Projects like ITER and SPARC aim for commercialization by the 2030s.
• Algae Biofuels: Carbon-neutral alternative for aviation and heavy transport.
Renewables are no longer fringe alternatives—they're the backbone of the global energy shift. With continued innovation and investment, a zero-emission future is within reach.

36. Look through the text and describe it briefly

Solar Energy and Low Power Consumption: A Sustainable Synergy
Solar energy has emerged as a cornerstone of sustainable power, especially when paired with low-power technologies. As global energy demands rise, combining high-efficiency photovoltaics with ultra-low-power devices offers a path to reduce carbon footprints while maintaining performance.

1. High-Efficiency Solar Panels
• Perovskite Solar Cells: Achieve over 30% efficiency (vs. 22% for traditional silicon) and perform better in low-light conditions.
• Bifacial Panels: Capture sunlight on both sides, increasing energy output by 10–20%.
• IoT and Sensors: Solar-powered sensors (e.g., EnOcean) operate for years without batteries, enabling smart buildings and agriculture.
• Portable Solar Chargers: Compact panels (like Anker SolarPort) power smartphones and laptops off-grid.
• Solar + Supercapacitors: Provide rapid energy bursts for low-power devices, extending lifespan.
• Solar Batteries: Systems like Tesla Powerwall store excess energy for nighttime use.
• ARM Cortex-M Processors: Consume microwatts, ideal for solar-powered IoT devices.
• Energy-Harvesting Chips: Convert ambient light into power for wireless sensors.
• Dynamic Power Scaling: Adjusts device performance based on available solar energy.
• AI Optimization: Predicts energy needs to minimize waste (e.g., Google's DeepMind for data centers).
• Passive Solar Buildings: Use natural light/heat to cut energy use by 30%.
• Solar Windows: Transparent photovoltaic glass (e.g., Ubiquitous Energy) generates power without aesthetics trade-offs.
• Intermittency: Hybrid systems (solar + wind) can ensure steady supply.
• Recycling: Improving solar panel disposal to reduce e-waste.
• Scalability: Expanding access in developing regions.
• Solar Paint: Converts surfaces into energy generators.
• Biohybrid Solar Cells: Integrate plant proteins for enhanced efficiency.
The fusion of solar energy and low-power tech is revolutionizing sustainability—from smart cities to off-grid solutions. By prioritizing efficiency and innovation, we can power the future without compromising the planet.

37. Look through the text and describe it briefly

Deforestation in the Amazon Rainforest and Its Global Climate Impact
The Amazon rainforest, often called the "lungs of the Earth, " is experiencing rapid deforestation, with 13% of its original area already lost. This destruction not only threatens biodiversity but also accelerates global climate change by disrupting carbon storage, rainfall patterns, and weather systems worldwide.
Causes of Deforestation are as follows:
1. Agricultural Expansion: Cattle ranching (responsible for 80% of deforestation) and soybean farming drive large-scale land clearing.
2. Illegal Logging: Timber extraction fuels forest degradation, often followed by fires.
3. Infrastructure Projects: Roads (e.g., BR-163 highway) and dams fragment the forest, enabling further exploitation.
4. Climate Feedback Loops: Droughts caused by deforestation make forests more prone to wildfires.
Global Climate Impacts
• The Amazon stores 150-200 billion metric tons of carbon—equivalent to 15-20 years of global CO_2 emissions.
• Deforestation releases 1.5 billion tons of CO_2 annually (comparable to Japan's total emissions).
• The rainforest generates 20% of Earth's freshwater, feeding "flying rivers" that regulate rainfall across South America and beyond.
• Deforestation in Brazil has reduced rainfall in regions as far as California and Europe (NASA studies).
• The Amazon hosts 10% of Earth's species. Their loss weakens ecosystems that stabilize the climate (e.g., carbon-sequestering plants).
• Scientists warn that losing 20-25% of the Amazon could trigger an irreversible shift to savanna, releasing catastrophic carbon stores.
• Protected Areas: Indigenous territories (e.g., Kayapó lands) reduce deforestation rates by 2-3 times.
• Satellite Monitoring: Real-time systems (e.g., INPE's DETER) track illegal logging.
Sustainable Alternatives
• Agroforestry: Combines crops with native trees to restore soil and biodiversity.

• International Pressure: The EU Deforestation Regulation bans imports linked to deforestation.
3. Ongoing Challenges
• Political Short-Termism: Brazil's policies fluctuate with leadership changes.
• Global Demand: Beef, soy, and palm oil markets continue driving land grabs.
The Amazon's fate is tied to global climate stability. Protecting it requires local action, international cooperation, and sustainable economies—before its degradation triggers irreversible planetary consequences.

38. Look through the text and describe it briefly

El Niño and La Niña: The Climate Phenomena Shaping Our Planet
El Niño and La Niña are opposite phases of the El Niño-Southern Oscillation (ENSO) cycle - a natural climate pattern that occurs across the tropical Pacific Ocean every 2-7 years. These phenomena significantly influence global weather patterns, affecting temperature, precipitation, and extreme weather events worldwide.
1. El Niño (The Warm Phase)
• Occurs when trade winds weaken, allowing warm water to spread eastward
• Sea surface temperatures rise by 1-3°C in central/eastern Pacific
• Typically lasts 9-12 months
• More frequent and intense due to climate change (occurring every 2-3 years recently)
2. La Niña (The Cool Phase)
• Happens when trade winds strengthen, pushing warm water westward
• Cooler-than-average sea surface temperatures develop
• Often lasts 1-3 years
• Can occur consecutively ("double-dip" or "triple-dip" events)
Global Climate Impacts
El Niño Effects:
• Droughts: Southeast Asia, Australia, Southern Africa
• Floods: Western South America, Southern U.S.
• Warmer global temperatures (boosts climate change effects)
• Reduced Atlantic hurricane activity
La Niña Effects:
• Increased rainfall: Southeast Asia, Northern Australia
• Drought conditions: Southern U.S., East Africa
• More active Atlantic hurricane seasons
• Cooler global temperatures (temporarily masks climate change)
Economic and Ecological Consequences
1. Agriculture: Crop failures or surpluses depending on region
2. Fisheries: Collapse of anchovy fisheries during El Niño
3. Health: Spread of diseases (malaria, dengue) due to changing rainfall
4. Energy: Hydropower production fluctuations
Current Status and Future Outlook
• The 2023-2024 El Niño was one of strongest on record
• Climate models predict increasing frequency/intensity of both phenomena
• Scientists are improving prediction systems (up to 6-9 months in advance)
• Understanding ENSO is crucial for climate adaptation strategies
While natural phenomena, El Niño and La Niña are being modified by human-caused climate change. Their growing intensity underscores the need for better prediction systems and climate-resilient infrastructure worldwide.

39. Look through the text and describe it briefly

The Gulf Stream's Vital Role in Europe's Climate
The Gulf Stream is a powerful Atlantic Ocean current that transports warm water from the Gulf of Mexico to Northwestern Europe. This "heat conveyor belt" is responsible for Europe's unusually mild climate given its high latitudes, making winters in London warmer than those in Newfoundland at the same latitude.
How the Gulf Stream Works

1. Current Mechanics:
o Begins in the Gulf of Mexico (water heated to 30°C)
o Flows northeast at 2-5 mph (100x Amazon River volume)
o Cools near Greenland, sinks, and returns south (AMOC circulation)
2. Heat Transfer:
o Releases heat equivalent to 1.5 million nuclear power plants
o Raises European temperatures by 5-10°C in winter
Europe's Climate Dependence
Temperature Regulation:
• UK/Ireland: 10°C warmer than same-latitude Canada
• Norway: Coastal ports remain ice-free year-round
• France: Enables wine-growing at 48°N (parallel to Canada's cold Newfoundland)
Precipitation Patterns:
• Brings moisture for Western Europe's rainfall
• Supports agriculture from Ireland to Ukraine
Climate Change Threats
1. AMOC Weakening:
o 15% slowdown since 1950 (IPCC data)
o Melting Greenland ice dilutes salty water, disrupting sinking mechanism
2. Potential Collapse:
o Could lower European temperatures by 3-5°C
o May increase storms and shift rain belts southward
Economic and Ecological Impacts
1. Agriculture:
o UK growing seasons could shorten by 30 days
o Mediterranean drought intensification
2. Energy:
o Increased winter heating demands
o Reduced hydropower in Scandinavia
3. Ecosystems:
o North Sea fisheries disruption
o Boreal forest migration
Monitoring and Solutions
1. Research Initiatives:
o RAPID array (monitors AMOC since 2004)
o EU's TRIATLAS project
2. Climate Mitigation:
o Reducing greenhouse gas emissions
o Protecting Arctic ice sheets
The Gulf Stream is Europe's invisible climate guardian. While complete collapse is unlikely this century, its gradual weakening could significantly alter Europe's climate. Protecting this natural wonder requires global climate action and continued scientific monitoring.

40. Look through the text and describe it briefly

The Foundation Period of London: Birth of a Global City (43 AD - 410 AD)
London's origins trace back to a strategic decision by Roman invaders in 43 AD, when Emperor Claudius established Londinium as a key military and trading settlement. This foundational period shaped the city's enduring character through several critical developments:
Roman Establishment (43-60 AD)
Founded as a river port at the narrowest Thames crossing point
Initial settlement covered 1.4 km² (modern City of London area)
Strategic location connected roads to major Roman British towns
Boudican Revolt & Rebuilding (60-120 AD)
Destroyed in 60 AD by Iceni tribe led by Queen Boudica (королева Боадицея), a queen of the ancient British Iceni tribe (племя иценов), who led a failed uprising against the conquering forces of the Roman Empire in AD 60 or 61.

Reconstructed with improved stone defenses and grid-pattern streets
Built first London Bridge (wooden, near modern bridge location)
Peak Roman Development (2nd-4th Century)
Became provincial capital of Britannia by 100 AD
Constructed major infrastructure:
Basilica (largest north of Alps)
Amphitheater (discovered under Guildhall)
3 km defensive wall (sections still visible)
Reached population of 30, 000-45, 000
Key Foundations for Future Growth
Established as England's first international trade hub
Created enduring street patterns still visible today
Built original Thames embankments
Developed as administrative center (traits continuing today)
Decline and Transition (5th Century)
Roman withdrawal around 410 AD led to urban decline
Settlement continued at reduced scale (Saxon Lundenwic)
Original walls maintained through Middle Ages
The Roman foundation established London's lasting advantages: strategic location, commercial orientation, and administrative importance - qualities that would eventually propel it to global prominence.

41. Answer the question

What places of interest are there in London?

42. Answer the question

What can you say about the system of higher education in Russia?

43. Answer the question

Does Russia have a borderline with the USA?

44. Answer the question

What is the longest river in the European part of Russia? What can you say about it?

45. Answer the question

What do you know about climate in England?

46. Answer the question

In what wat have computers changed our life?

47. Answer the question

What do you know about theaters in Moscow?

48. Answer the question

Answer the question: “How do you feel about artificial intelligence like Siri and Alexa?”

49. Answer the question

How have technological advances affected communication ?

50. Answer the question

How have technological advances affected education?

51. Answer the question

What do you think is the biggest advantage of modern technology?

52. Answer the question

Is there a tech product you want these days? What is it? How will it make your life better?”

53. Answer the question

How has technology impacted our work, studies and career?

54. Answer the question

What do you think is the most important breakthrough in history ?

55. Answer the question

What industrial applications of electricity do you know ?

56. Answer the question
What makes it possible to eliminate air and water pollution?
57. Answer the question
What actions are necessary to take to deal successfully with the problem of protecting the environment throughout the world ?
58. Answer the question
What interesting facts do you know about the University of Cambridge?
59. Answer the question
What sights are there in London ?
60. Answer the question
What are you favorite places of interest in Moscow ?

2 семестр, Экзамен
Контролируемые ИДК: УК-4.1 УК-4.3
Вопросы/Задания:
1. Answer the question
In what way has the launching of artificial satellites changed the profession of a surveyor?
2. Answer the question
Answer the question: What can you say about total stations?
3. Answer the question
Why is it important to have correct maps?
4. Answer the question
Answer the question: What are the principles the GPS is based on?
5. Answer the question
What modern surveying methods do you know?
6. Answer the question
What definition can be given of geodesy?
7. Answer the question
What event became the advent of space geodesy?

8. Answer the question
In what way has the launching of artificial satellites changed the profession of a surveyor?
9. Answer the question
Why is it important to have correct plot plans?
10. Answer the question
What do you know about cadasters and land registration systems?
11. Answer the question
In what way do cadasters promote land market?
12. Answer the question
What is the difference between the cadaster and the land registration system?
13. Answer the question
What is the difference between 2D and 3D cadasters?
14. Answer the question
What is the distinction between cadastral and other large-scale maps?
15. Answer the question
Can you describe the place of cadastral surveys and registration of rights in rural development?
16. Answer the question
What, from your point of view, are advantages of cadastral surveys and registration of rights?
17. Answer the question

What can you say about the role of sale in cadastral maps?

18. Answer the question

How are points identified in a map? What methods do you know?

19. Answer the question

What two methods of map production do you know? Which one is more cost-effective and economic?

20. Answer the question

Where the first cadaster appeared? What was its purpose?

21. Look through the text and tell about types of surveys

SPECIALIZED TYPES OF SURVEYS

Many types of surveys are so specialized that a person proficient in a particular discipline may have little contact with the other areas. Persons seeking careers in surveying and mapping, however, should be knowledgeable in every phase, since all are closely related in modern practice. Some important classifications are described briefly here.

Topographic surveys determine locations of natural and artificial features and elevations used in map making.

Land, boundary, and cadastral surveys establish property lines and property corner markers. The term cadastral is now generally applied to surveys of the public lands systems. There are three major categories: original surveys to establish new section corners in unsurveyed areas that still exist in Alaska and several western states; retracement surveys to recover previously established boundary lines; and subdivision surveys to establish monuments and delineate new parcels of ownership. Condominium surveys, which provide a legal record of ownership, are a type of boundary survey.

Ground, aerial, and satellite surveys are broad classifications sometimes used. Ground surveys utilize measurements made with ground-based equipment such as automatic levels and total station instruments. Aerial surveys are accomplished using either photogrammetry or remote sensing. Photogrammetry uses cameras that are carried usually in airplanes to obtain images, whereas remote sensing employs cameras and other types of sensors that can be transported in either aircraft or satellites. Procedures for analyzing and reducing the image data are described further. Aerial methods have been used in all the specialized types of surveys listed, except for optical tooling, and in this area terrestrial (ground-based) photographs are often used. Satellite surveys include the determination of ground locations from measurements made to satellites using GNSS receivers, or the use of satellite images for mapping and monitoring large regions of the Earth.

22. Look through the text and tell about height determination

HEIGHT DETERMINATION

Heights of surface features above sea level are determined in four main ways: by spirit leveling, by measuring vertical angles and distances, by measuring differences in atmospheric pressure, and, since the late 20th century, by using three-dimensional satellite or inertial systems. Of these the first is the most accurate; the second is next in accuracy but faster; the third is least accurate but can be fastest if heights are to be measured at well-separated points. The last two techniques require sophisticated equipment that is still very expensive.

In spirit leveling the surveyor has for centuries used a surveying level, which consists of a horizontal telescope fitted with cross hairs, rotating around a vertical axis on a tripod, with a very sensitive spirit level fixed to it; the instrument is adjusted until the bubble is exactly centred. The reading on a graduated vertical staff is observed through the telescope. If such staffs are placed on successive ground points, and the telescope is truly level, the difference between the readings at the cross hairs will equal that between the heights of the points. By moving the level and the staffs alternately along a path or road and repeating this procedure, differences in height can be accurately measured over long horizontal distances.

In the most precise work, over a distance of 100 kilometres the error may be kept to less than a centimeter. To achieve this accuracy great care has to be taken. The instrument must have a high-magnification telescope and a very sensitive bubble, and the graduated scale on the staff must be made of a strip of invar (an alloy with a very small coefficient of thermal expansion). Moreover, the staffs must be placed on pegs or special heavy steel plates, and the distance between them and the level must always be the same to cancel the effects of aerial refraction of the light.

In less precise work a single wooden staff can be used; for detailed leveling of a small area, the staff is moved from one point to another without moving the level so that heights can be measured with a radius of about 100 metres. The distances of these points from the instrument can be measured by tape or more commonly, by recording not only the reading at the central cross hair in the field of view of the telescope but also those at the stadia hairs, that is by tachymetry. The bearing of each point is observed by compass or on the horizontal circle of the level so that it can be plotted or drawn on the map.

Since the 1950s levels have been introduced in which the line of sight is automatically leveled by passage through a system of prisms in a pendulum, thus removing the need to check the bubble. The disadvantage of spirit leveling is the large number of times the instrument has to be moved and realigned, particularly on steep hills; it is used primarily along practically flat stretches of ground.

23. Can you describe the Universal Transverse Mercator (UTM) system?

There are many purposes for which large-scale air photographs are required, other than for the making of maps. Such cases are erosion surveys, forest inventory surveys, land-use surveys and many others. It may often prove economical to use aerial photography that meets the needs of the cadastral survey and to make maps on this basis, even though the cost of such photography would not be justified solely for the purposes of cadastral mapping.

The general conclusions drawn from the above observations may be stated as follows:

1.Where air surveys are part of the ordinary survey practice of a country, they may also prove suitable for large cadastral jobs, provided that the amount of supplementary ground work required is not so large as to make it more economical to use ground staff alone. In such cases it may be economical to use photography of sufficiently large scale to meet the needs of cadastral surveying even though this exceeds the requirements of other mapping projects. To carry out a dual or multiple purpose survey through one set of photographs may make economic sense. Often however the needs of different applications of the photography are incompatible and multiple sets of photography may be required.

2.Where a new cadastral survey of a large area is required to be carried out quickly, air survey is often the best practical method, unless a great deal of supplementary ground work proves necessary.

3.Unless reasonably full-time employment can be found for the staff and equipment of a national mapping agency's air survey department, it will usually be better to contract the work out to a commercial agency.

4.Cadastral surveys of small areas, extensions to existing surveys, and revision work will usually best be done by the ground staff of the national cadastral survey organization, according to a continuous programme.

24. Look through the text and tell about surveying computerization

Here, we review the impact of computers on the surveying and mapping of land parcels, and on the recording and dissemination of land-related information. The main advantage of computerization is the speed with which data may be handled.

Computers can, inter alia, be used to:

j. speed up the collection and processing of cadastral survey data;
k. make significant reductions in the cost and space required for storing and retrieving land records;
l. prevent unnecessary duplication of records;
m. simplify the preparation of “back-up” copies of registers in case of disaster;
n. accelerate the processing of data for the first registration of title;
o. reduce the time and cost involved in transferring property rights and in processing mortgages;
p. facilitate the monitoring and analysis of market and rental values of land and property;
q. provide better estimates of the value of land for taxation or compulsory acquisition;
r. improve efficiency and effectiveness in collecting land and property taxes;

The list of possible applications of information technology (IT) is almost endless. It is often as valid to ask whether a country can afford to be without a good computerized land information system as it is to ask whether it can afford to install one.

Computerization speeds up the processes of field and photogrammetric survey, the storage, retrieval and analysis of data, and the preparation and production of cadastral maps and plans. Automatic data recording has two advantages - it reduces the human mistakes that occur in writing down and

subsequently transcribing field survey observations, and it facilitates the transfer of data for subsequent computation and adjustment. In spite of the increased cost of modern surveying equipment, productivity can be significantly increased through the use of computers. This then makes it possible to reduce the unit costs of survey.

25. . Look through the text and tell about the 3D modelling?

When planning a 3D surveying and modeling project, beside all the technical parameters that should be kept in mind (e.g. location, accessibility, geometric detail, budget), a very crucial thing to know is the final user of the 3D data and the final project's goal, in order to clarify what is actually needed.

Nowadays there is a large number of geomatics data acquisition tools for mapping purposes and for visual Cultural Heritage digital recording. These include satellite imagery, digital aerial cameras, radar platforms, airborne and terrestrial laser scanners, UAVs, panoramic linear sensors, SRL or consumer-grade terrestrial digital cameras and GNSS/INS systems for precise positioning. Beside data acquisition systems, today new software has been developed and many automated data processing procedures are available. For what concerned new functionality for 3D data management, there are new advances in Geographic Information Systems (GIS) and 3D repositories (e.g. BIM) while in the visualization field the rendering and animation software are now more affordable with lower costs and higher results. The continuous development of new sensors, data capture methodologies and multi-resolution 3D representations are contributing significantly to the documentation, conservation, and presentation of heritage information and to the growth of research in the Cultural Heritage field. The generation of reality-based 3D models of heritage sites and objects is nowadays performed using methodologies based on passive sensors and image data, active sensors and range data, classical surveying (e.g. total stations or GNSS), 2D maps, or an integration of the aforementioned techniques.

3. Answer the question: What modern surveying methods do you know?

26. Look through the text and tell about hydrographic surveying

HYDROGRAPHY

Surveying of underwater features, or hydrographic surveying, formerly required techniques very different from ground surveying, for two reasons: the surveyor ordinarily was moving instead of stationary, and the surface being mapped could not be seen. The first problem, making it difficult to establish a framework except near land or in shoal areas, was dealt with by dead reckoning between points established by astronomical fixes. In effect a traverse would be run with the ship's bearing measured by compass and distances obtained either by measuring speed and time or by a modern log that directly records distances. These have to be checked frequently, because however accurate the log or airspeed indicator and compass, the track of a ship or aircraft is not the same as its course. Crosscurrents or winds continually drive the craft off course, and those along the course affect the speed and the distance run over the ground beneath.

The only way a hydrographer could chart the seabed before underwater echo sounding and television became available was to cast overboard at intervals a sounding line with a lead weight at the end and measure the length of the line paid out when the weight hit the bottom. The line was marked in fathoms, that is, units of one one-thousandth of a nautical mile, or approximately six feet (1,8 metres).

Sounding by lead is obviously very slow, especially in deep waters, and the introduction of echo sounding in the early 20th century marked a great improvement. It was made possible by the invention of electronic devices for the measurement of short intervals of time. Echo sounding depends on timing the lapse between the transmission of a short loud noise or pulse and its return from the target – in this case the bottom of the sea or lake. Sound travels about 5,000 feet (1.500 metres) per second in water, so that an accuracy of a few milliseconds in measurements of the time intervals gives depths within a few feet.

27. Look through the text and tell about Very Long Base Interferometry and Global Navigation Systems

VLBI observes radio signals emitted by quasars. These fixed points constitute the ICRF, and variations in the orientation of the Earth are measured with respect to the ICRF. This technique is sensitive to processes that change the relative position of the radio telescopes with respect to the

source, such as a change in the orientation of the Earth in space or a change in the position of the telescopes due to, for example, tidal displacements or tectonic motions. If just two telescopes are observing the same source, then only two components of the Earth's rotation can be determined. A rotation of the Earth about an axis parallel to the baseline connecting the two radio telescopes does not change the relative position of the telescopes with respect to the source, and hence this component of the Earth's orientation is not determinable from VLBI observations taken on that single baseline. Multibaseline VLBI observations with satisfactory geometry can determine all of the components of the Earth's rotation including their time rates-of-change. In fact, the motion of the axis of rotation of the Earth in space (precession and nutation) and the rotation angle around the axis of rotation are uniquely monitored by VLBI through its direct connection to the ICRF.

GNSS: GNSS signals observed by a network of ground stations can be used to determine the orientation of the network of receivers as a whole. In practice, in order to achieve higher accuracy, more sophisticated analysis techniques are employed to determine the EOPs and other quantities such as orbital parameters of the satellites, positions of the stations, and atmospheric parameters such as the zenith path delay. Only polar motion and its time rate-of-change can be independently determined from GNSS measurements. UT1 cannot be separated from the orbital elements of the satellites and hence cannot be determined from GNSS data. The time rate-of-change of UT1, which is related to the length of the day, can be determined from GNSS measurements. But because of the corrupting influence of orbit error, VLBI measurements are usually used to constrain the GNSS-derived Length of Day (LOD) estimates.

28. Look through the text and find where cadaster surveys are described. Tell about them

SPECIALIZED TYPES OF SURVEYS

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29. Look through the text. Tell about about zoning laws

Zoning laws divide property use into residential, commercial and industrial uses. Zoning laws and land use restrictions tell landowners what they may do with their property. Typically, they divide the land into residential, commercial and industrial uses. There are often several subdivisions or mixed categories within the three main categories. For example, a residential category may have a subdivision for high-density housing. There may be another category for houses that require large lots and setbacks from the road. Low-density residential zones may have restrictions on home businesses or terms of property rental.

Residential zones may also combine with commercial zones for mixed-use zones with storefronts and residential units. There may be separate categories for transient housing like hotels or

dormitories. It's up to each government body to determine how to categorize zoning and restrict land use.

Most land use and zoning laws occur at the local level. The authority to create land use restrictions and zoning law comes from the police powers that are left to each state. The U.S. Constitution gives only limited powers to the federal government. Powers not given to the federal government are left to the states. Each state has the power to pass laws and enforce them as they see fit.

Most states, in turn, delegate zoning and land use authorities to local governments. They believe that local governments are in the best position to manage their own affairs. For that reason, most land use and zoning laws occur at a municipal level.

Legal challenges to zoning laws. One of the first U.S. Zoning cases was Village of Euclid, Ohio v Ambler Realty Co. The case upheld the use of zoning laws when the laws serve a legitimate government purpose and do not unreasonably burden the property owner. However, in the Nectow v. City of Cambridge case, the U.S. Supreme Court ruled that there are instances where a government entity may make a zoning law that is too burdensome or serves no public purpose. Often, the outcome of a case hinges on the particular facts and even the effect of the restriction on the individual property owner. It's critically important for a land use and zoning attorney to build the case on behalf of their client with supporting evidence and legal precedent.

30. Look through the text and find where cadasters are described. Tell about them

Cadasters can be described as juridical (focusing on ownership), fiscal (focusing on land and property values for taxation), land use (recording the different ways in which the land is used) and multi-purpose (serving a variety of needs). In some countries the term 'juridical cadastre' is taken to refer to the land book, although strictly speaking a cadastre should cover the whole of a country while many land book systems contain details of only those parcels that have been subject to a land transaction. Some cadasters contain relatively few items of information, while others are more complex (for example, see annex II and the contents of the register in Lithuania). In some cases countries have operated several cadasters, each with a different objective and this has resulted in the same information being registered at least twice.

A key element in many land record systems is the cadastral map or plan. The term 'plan' is often used since historically most graphical representations of areas of ownership treat the land as two-dimensional or flat. Cadastral plans serve one of two purposes – to locate areas of land and to provide information about each area. They may provide details about a single parcel of land in support of a land book entry (in which case they may be called filed plans, title plans, survey plans or even cadastral diagrams); or they may show all the parcels within a given area and thus act as an index to help identify each one of them relative to the others (hence they may be called index or cadastral maps or plans). In some cases the data on index maps are less geometrically precise than on cadastral plans. In both cases they provide important information on the location, size and shape of the land that is registered.

31. Look through the text and tell about cadasters and land registration systems

Cadasters and land registration systems

There are various ways in which details about the land may be recorded, reflecting the diverse ways in which land can be viewed. Broadly speaking there have been two approaches, one focusing on its legal aspects and the other

on its fiscal or resource potential. The former, called land registration or the land book system, concentrates on the abstract rights associated with the land.

The latter is the cadasters and often contains more evidence about the physical size and shape of areas, and data on land values or land use. Dual and integrated systems exist, depending on the history of the country concerned.

Land registration is the process of recording rights in land either in the form of a register of deeds and other documents associated with the ownership of the land rights or else in the form of a register of titles to land. The titles registers are supported by maps such as topographic maps that do not necessarily show legal boundaries or cadastral maps, the origins of which often lie in real property taxation rather than land registration.

Land registration is a component of good governance. If wealth is to be generated from land then according to the UNECE report on the Social and Economic Benefits of Good Land Administration (HBP/1998/8, para.5):

"For nations to unlock that wealth requires effective systems of land registration. Good land registration promotes an active land market and productive land use. It makes possible the security of tenure and the development of a mortgage market on which a functioning economy depends."

Land registration provides security of tenure for those whose land is registered. In much of Europe the records of ownership have been maintained in land books, for example the German Grundbuch. Such records identify the piece of land affected, the names of the owners and the particular property rights that are associated with it.

32. Look through the text.Tell about air suveys and purposes for which large-scale air photographs are required

There are many purposes for which large-scale air photographs are required, other than for the making of maps. Such cases are erosion surveys, forest inventory surveys, land-use surveys and many others. It may often prove economical to use aerial photography that meets the needs of the cadastral survey and to make maps on this basis, even though the cost of such photography would not be justified solely for the purposes of cadastral mapping.

The general conclusions drawn from the above observations may be stated as follows:

1. Where air surveys are part of the ordinary survey practice of a country, they may also prove suitable for large cadastral jobs, provided that the amount of supplementary ground work required is not so large as to make it more economical to use ground staff alone. In such cases it may be economical to use photography of sufficiently large scale to meet the needs of cadastral surveying even though this exceeds the requirements of other mapping projects. To carry out a dual or multiple purpose survey through one set of photographs may make economic sense. Often however the needs of different applications of the photography are incompatible and multiple sets of photography may be required.
2. Where a new cadastral survey of a large area is required to be carried out quickly, air survey is often the best practical method, unless a great deal of supplementary ground work proves necessary.
3. Unless reasonably full-time employment can be found for the staff and equipment of a national mapping agency's air survey department, it will usually be better to contract the work out to a commercial agency.
4. Cadastral surveys of small areas, extensions to existing surveys, and revision work will usually best be done by the ground staff of the national cadastral survey organization, according to a continuous programme.

33. Look through the text and tell about the land market and its forms

The land market

Land markets exist in a number of forms. They may be formal and subject to the procedures laid down by the State, or informal and unstructured as is often the case in less developed economies. They operate in rural areas, where the main interest is usually in agricultural land or forestry, and in urban areas, where industrial, commercial and residential interests predominate. They may be based around the sale of freehold or long-term leasehold (the sales market) or on shorter-term leases (the rental market). They may involve the sale of specific rights in the land such as air rights or profit à prendre, in which the right to take produce or other benefit from the soil is sold to another person.

Land markets may also take the form of mortgage markets. A mortgage involves the transfer of certain rights in a legal estate as security for a financial loan with the provision that those rights will cease when the loan is paid off by a certain date. The mortgage may be in the form of a written agreement or the deposit with the lender of the title deeds of the borrower's land.

Land sales markets influence the level of investment in industry and the efficiency of agricultural production since the land can be used to borrow money against the estimated market price that would be paid for the property.

In urban areas rental markets create opportunities for people to migrate to where work is currently available, while for rural communities they allow agricultural land to be used more efficiently by farmers renting land that they cannot afford to buy but which they can use productively.

34. Look through the text and tell about the land market and its forms

One principal method of identification of points used in cadastral maps is the “grid”. In some countries, such as much of the public lands in the United States, a grid has been laid out on the ground creating a “rectangular system”. All parcels of land are formed by straight lines, often running north to south and east to west. The problem with such a system is that it is unsympathetic to the natural topography but its advantage is its simplicity and the relative clarity of the boundaries on the ground. More commonly however a grid is used as a referencing system so that the coordinates of all boundary turning points can be measured, calculated and recorded. The data can then be stored in a computer and used either to draw the cadastral maps or else for helping a surveyor to re-establish lost boundary marks.

The land parcel reference number can be used to identify the plot. It can be cross-referenced both to the files that contain more detailed survey information about the parcel such as its dimensions, and to the data on ownership, value and use. In many countries the records of survey are held in one government department (the Survey Department) while text data and details of title are held in another. The latter may, for example, be the Lands Department, the Ministry of Justice or even the Government Treasury. It is important that wherever records of land parcels are maintained, every authority adopts the same standard land parcel referencing system.

It is also essential that changes in land parcel boundaries be recorded as soon as they are agreed. All interested parties must be notified immediately of any changes that have taken place affecting land parcels, for example where there has been formal subdivision. A cadastral map must be up to date at all times.

35. Look through the text.Can you describe the Universal Transverse Mercator (UTM) system?

Universal Transverse Mercator (UTM)

The Universal Transverse Mercator (UTM) system is another important plane coordinate system. Originally developed by the military for artillery use, it provides worldwide coverage from 80° South latitude to 84° North latitude. Each zone has a width of 6° 00'00",which requires 60 zones to cover the entire earth. The zones are numbered easterly from 180° West longitude. New Jersey is located in zone 18.

Longitudes and latitudes used in UTM calculations are based on Clarke 1866, the same ellipsoid used in NAD 27.

The UTM system is a modified transverse mercator projection. It has recently taken on new importance since UTM coordinates are widely used in GIS/LIS. Current USGS 7 1/2 minute quad sheets, as well as other maps in the national mapping program now show 10,000 meter grid ticks to allow manual plotting in this system.

The central meridian of each zone is assigned an easting of 500,000meters and a northing of 0 meters is applied to the equator for the northern portion and 10,000,000 meters applied to the equator for the southern portion. The scale factor at the central meridian is set to 0.9996 or a relative accuracy of 1:2500. UTM was not adopted by NGS as the state’s plane coordinate system for several reasons. One reason is that a relative accuracy of 1:2500 is too low to make it practical for surveying projects. Another reason is that UTM does not conform to state boundaries, which is a desirable feature for a state plane coordinate system. It is desirable to place the central meridian or the standard parallels in the center of a state to minimize projection distortions. This cannot be done with the rigid structure of the UTM system. Surveyors may encounter UTM when dealing with buildings on the National Historic Register, sewer outfalls, historic sites, etc.

36. Look through the text and tell about the land market and its forms

Cadastral maps are essentially descriptions of the parcels of land (survey plots or holdings) with reference to which rights in land are defined and the holders of these rights identified. Cadastral maps are not in themselves a record of any right held, although it is true that they may be used to differentiate certain types of tenure, for example state and non-state land, reserved forests, and land held by public authorities or under certain tenures (for example religious or charitable foundations). In such cases, the maps may become a part of the record of rights. The formal record of rights is normally contained in one or more “registers” that in some countries are known as the “Land book”. These registers will normally be supported by cadastral maps. The converse is however not true and

cadastral maps can exist without registers of rights, for example where they are the original record of a classification of land for taxation purposes.

Registers of rights must be distinguished from registers of deeds. A deed is a written instrument recording a transaction affecting, or purporting to affect, a right. Deeds may be registered for the public convenience or in the interests of private persons. A deed is only executed when there is some change in the possession of a right and a register of deeds is a record of transactions in rights and not of the rights themselves. Registration of deeds may, however, have an important part to play in the preparation or maintenance of a register of rights, as will be discussed later.

Rights in land are of many kinds, varying from full ownership to a mere conditional right of access at certain times and for certain purposes. Rights in water also exist and may be held separately or on a different basis from the rights in the land on or under which the water is found. There may also be separate rights in trees and minerals, etc. A complete register of rights should take account of all these rights but in practice few such complete registers exist, and most people when they speak of registration of rights in land are thinking only of the registration of title, that is of rights of ownership (or perhaps more broadly those of primary tenure).

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37. Look through the text and tell about the land market and its forms

It should also be noted that many rights in land and water or in the produce of land and water, other than rights of individual possession of land, are in fact registered in forms other than the formal land registers. Under the better systems of forest administration, for example, it is common practice for the orders constituting new forest reserves to be set out in considerable detail (sometimes extending to actual lists of names). Such orders would define the nature and extent of rights of residence, cultivation, grazing, timber extraction and collection of wild produce by individuals or villages that subsist in the forest after reservation. Leases to work inland fisheries often contain clauses describing the rights of neighboring cultivators in respect of use and control of the water, and place limitations, based on these rights, on the extent to which the lessee may obstruct or divert the flow of water. All these things are in effect methods of registering rights in land otherwise than in the ordinary land register. That departmentally it may be convenient to keep separate records of some of them does not detract from the fact that they are essentially part of the national record of rights in land and should be so regarded.

Some classes of rights in land cannot be disregarded such as rights of secondary occupation or use of land. Some of these, for example hereditary and life tenancies, occupancy rights, etc. derogate so importantly from the rights of the primary possessor that they must necessarily find a place in every register of rights. Others, for instance seasonal tenancies that are not renewed, are so ephemeral that the trouble of keeping the register up-to-date may not be justified by the advantages of having these rights registered.

38. Look through the text and tell about the land market and its forms

Another important class of rights in land consists of liens and conditional reversions, including mortgages and pledges in security. The large class of usufructuary mortgages, which involve changes in physical possession, would probably be registered under any ordinary system of land registration. Simple mortgages not involving changes in physical possession are normally registered as documents where a system of registration of documents is in force, but may not find a place in land registers. Many pledges of land as collateral security may not be registered at all. There are, however, good reasons why all encumbrances to land should be publicly registered.

There is also a great variety of rights that do not involve possession, legal, physical or conditional, of the land itself. One of the most interesting of these arises from the fact that in some countries property in trees may be held and may pass quite separately from and independently of property in the land itself. Separate rights in minerals are a similar case. There are also many easements or servitudes, especially rights of grazing, of passage, of extraction of timber and forest produce, and of “profits à prendre” generally. These may be of great importance especially where public land is affected, or where a large estate is to be broken up. In such cases a public record of these may be of great value.

There is also a large class of public rights in land, including not only rights held by the state, but also rights held by large numbers of government departments and local authorities, village commons, and in some countries the sites of the villages themselves.

39. Look through the text and tell about the land market and its forms

A register of title clearly aims at something much more definite than this. Every parcel of land is originally placed in the register as a unit of property. Once this has been done, every transaction affecting the parcel is entered in the register with reference to the land itself and registration thus serves as evidence of title and as a bar to contrary claims. The difficulty lies in the nature of the evidence on which the original entry is based. Where registration is in force from the first occupation of land, no difficulty arises since clearly there is no question of any adverse claim having previously arisen. This is, however, seldom the case, and the question at once arises of the evidence required before a first entry is made in the register. The investigation of absolute title may be, and usually will be, a long, difficult and expensive process in each case, and at the worst may never produce a definitive result. On the other hand a system of registration based on possession, which is an obvious alternative, can provide presumptive evidence of title, though from a legalistic point of view such a register is little better than a register of deeds. Every year that passes, however, makes presumptive evidence more difficult to rebut and finality can always be achieved by legislation that lays down a limit to the time within which suits claiming an interest in land may be brought. It is, of course, claimed that by the custom of many countries, especially in Africa, mere lapse of time does not extinguish a right once acquired. It is fortunate that it is in precisely these countries that the public memory referred to above will be found to be most active and accurate. Hence there are strong grounds for thinking that, provided that the inquiry on which initial registration is based is local and public and that care is taken that the purpose of the inquiry is understood by the people concerned, the claims of absentees will not go by default, even in the first instance.

40. Look through the text and tell about land administration

The scope of land administration

The term ‘land administration’ refers to the management of information about the ownership, value and use of land and its associated resources. The function of a land administration system is to record, maintain and make available information that can create security of tenure and support the land market.

Ownership is essentially a legal process that depends on ‘title’, that, is the evidence that proves who has the right to property. The way in which rights over land are held is referred to as the system of land tenure, the most common forms of which are called freehold and leasehold. Freehold provides the owner with the maximum rights permissible within the tenure system; it is subject to a variety of restrictions, for example those imposed by physical planning regulations, and to the right of the State to acquire the land in the overall national interest (sometimes called the right of eminent domain).

Leasehold arises where there is a contractual arrangement under which a landlord (the lessor) grants the right of exclusive occupation of the land to a tenant (the lessee) for an agreed amount of money for an agreed period of time. Leasehold implies that there is a superior landowner (ultimately the freeholder), though when leases run for 999 years this may seem academic. Although such long leases are now unusual, periods of up to 99 years are still common.

All land has a value, although what it is worth depends on what is meant by ‘value’. From a financial perspective, this may relate to the price that would be paid for the land in an open market sale, the revenue that could be obtained from renting out the use of the land (known as the rental value), the construction costs for a building, or the value assessed for taxation purposes based on parameters such as its area and soil type that may not be directly connected with market prices.

41. Translate the text.

GEODETIC AND PLANE SURVEYS

Two general classifications of surveys are geodetic and plane. They differ principally in the assumptions on which the computations are based, although field measurements for geodetic surveys are usually performed to a higher order of accuracy than those for plane surveys.

In geodetic surveying, the curved surface of the Earth is considered by performing the computations on an ellipsoid (curved surface approximating the size and shape of the Earth). It is now becoming common to do geodetic computations in a three-dimensional, Earth-centered, Earth-fixed (ECEF)

Cartesian coordinate system. The calculations involve solving equations derived from solid geometry and calculus. Geodetic methods are employed to determine relative positions of widely spaced monuments and to compute lengths and directions of the long lines between them. These monuments serve as the basis for referencing other subordinate surveys of lesser extents.

In early geodetic surveys, painstaking efforts were employed to accurately observe angles and distances. The angles were measured using precise ground-based theodolites, and the distances were measured using special tapes made from metal having a low coefficient of thermal expansion. From these basic measurements, the relative positions of the monuments were computed. Later, electronic instruments were used for observing the angles and distances. Although these latter types of instruments are still sometimes used on geodetic surveys, satellite positioning has now almost completely replaced other instruments for these types of surveys. Satellite positioning can provide the needed positions with much greater accuracy, speed, and economy. GNSS receivers enable ground stations to be located precisely by observing distances to satellites operating in known positions along their orbits.

42. Translate the text.

Satellite positioning can provide the needed positions with much greater accuracy, speed, and economy. GNSS receivers enable ground stations to be located precisely by observing distances to satellites operating in known positions along their orbits. GNSS surveys are being used in all forms of surveying including geodetic, hydrographic, construction, and boundary surveying. The principles of operation of the global positioning system are given further, field and office procedures used in static GNSS surveys are discussed still further, and the methods used in kinematic GNSS surveys are discussed even further.

In plane surveying, except for leveling, the reference base for fieldwork and computations is assumed to be a flat horizontal surface. The direction of a plumb line (and thus gravity) is considered parallel throughout the survey region, and all observed angles are presumed to be plane angles. For areas of limited size, the surface of our vast ellipsoid is actually nearly flat. On a line 5 mi long, the ellipsoid arc and chord lengths differ by only about 0.02 ft. A plane surface tangent to the ellipsoid departs only about 0.7 ft at 1 mi from the point of tangency. In a triangle having an area of 75 square miles, the difference between the sum of the three ellipsoidal angles and three plane angles is only about 1 sec. Therefore, it is evident that except in surveys covering extensive areas, the Earth's surface can be approximated as a plane, thus simplifying computations and techniques. In general, algebra, plane and analytical geometry, and plane trigonometry are used in plane-surveying calculations. Even for very large areas, map projections allow plane-surveying computations to be used.

43. Translate the text.

Survey work of all kinds tends to be expensive and the precise comparative cost of air and ground methods can usually only be determined with regard to particular cases. Air survey methods benefit from economies of scale where a large number of boundaries or points of detail have to be recorded. The capital and running costs of aeroplanes and the equipment used in aerial surveys are high, and the personnel required are highly skilled and relatively well paid in comparison with some field surveyors. The number of days in the year on which flying can be done is normally quite small but then in many countries the number of days on which field survey work can be carried out is restricted for climatic reasons though not so much as for flying.

There may be difficulty in getting approval for air survey from the military authorities who in many countries have traditionally opposed public access to aerial photographs for supposed security reasons. Given the ready availability and quality of modern satellite imagery, this restriction makes little sense. Would-be terrorists can easily obtain from elsewhere the sort of information that opponents of public access to aerial photography seek to hide. Opposition to the use of aerial photography has increased the cost of many surveys and reduced their effectiveness with consequent but unmeasured costs that have significant impact on the national economy.

Broadly speaking, aerial photographs have been used in cadastral mapping in five different ways. In

the simplest case, contact scale or enlarged photographs may be used as a base on which to outline the parcels. In some countries it is sufficient to produce a plan which acts as a signpost to the parcels, the boundaries of which can be determined by inspection on the ground. In such cases there is no need to record the accurate dimensions of any land parcel so long as its boundaries are clearly visible on the photographs. Thus in Kenya, photographs enlarged to 1: 2,500 scale have been used to form the base from which the boundaries of the parcels could be traced. Such an approach is expedient where large numbers of parcels need to be recorded over a short period of time. Where time and money allow, the areas can be resurveyed to higher accuracy at a later date.

More accurate mapping may be achieved by using rectified photographs that remove any distortions occurring when the photography is not done with the camera pointing exactly vertically downwards. The Land Titling Programme in Thailand made extensive use of enlarged rectified photographs, with supplementary information provided by ground survey. Cadastral photomaps at scales of 1:4,000 and larger were produced. A similar technique was used in Botswana where the photo-maps were suitably annotated to identify particular parcels. Given a vast area of savannah country with no nearby ground survey control, it is possible to identify patterns in the vegetation and to trace on to the photographs the outlines of areas of land allocated for purposes such as veterinary stations, air strips and police posts. The dimensions of the plots can then be added from measurements made by taping on the ground. A disadvantage in using rectifiers is the relatively high cost of this equipment.

44. Translate the text.

Except for control surveys, most other types described are usually performed using plane-surveying procedures, but geodetic methods may be employed on the others if a survey covers an extensive area or requires extreme accuracy.

Ground, aerial, and satellite surveys are broad classifications sometimes used. Ground surveys utilize measurements made with ground-based equipment such as automatic levels and total station instruments. Aerial surveys are accomplished using either photogrammetry or remote sensing. Photogrammetry uses cameras that are carried usually in airplanes to obtain images, whereas remote sensing employs cameras and other types of sensors that can be transported in either aircraft or satellites. Procedures for analyzing and reducing the image data are described further. Aerial methods have been used in all the specialized types of surveys listed, except for optical tooling, and in this area terrestrial (ground-based) photographs are often used. Satellite surveys include the determination of ground locations from measurements made to satellites using GNSS receivers, or the use of satellite images for mapping and monitoring large regions of the Earth.

45. Translate the text.

TRIANGULATION

A system of triangles usually affords superior horizontal control. All of the angles and at least one side (the base) of the triangulation system are measured. Though several arrangements can be used, one of the best is the quadrangle or a chain of quadrangles. Each quadrangle, with its four sides and two diagonals, provides eight angles that are measured. To be geometrically consistent, the angles must satisfy three so-called angle equations and one side equation. That is to say the three angles of each triangle, which add to 180°, must be of such sizes that computation through any set of adjacent triangles with the quadrangles will give the same values for any side. Ideally, the quadrangles should be parallelograms. If the system is connected with previously determined stations, the new system must fit the established measurements.

When the survey encompasses an area large enough for the Earth's curvature to be a factor, an imaginary mathematical representation of the Earth must be employed as a reference surface. A level surface at mean sea level is considered to represent the Earth's size and shape, and this is called the geoid. Because of gravity anomalies, the geoid is irregular; however, it is very nearly the surface generated by an ellipse rotating on its minor axis – i.e. an ellipsoid slightly flattened at the ends, or oblate. Such a figure is called a spheroid. Several have been computed by various authorities; the one usually used as a reference surface by English-speaking nations is (Alexander Ross) Clarke's Spheroid of 1866. This oblate spheroid has a polar diameter about 27 miles (43 kilometres) less than its diameter at the Equator.

Because the directions of gravity converge toward the geoid, a length of the Earth's surface measured above the geoid must be reduced to its sea-level equivalent – i.e. to that of the geoid. These lengths are assumed to be the distances, measured on the spheroid, between the extended lines of gravity down to the spheroid from the ends of the measured lengths on the actual surface of the Earth. The positions of the survey stations on the Earth's surface are given in spherical coordinates.
Bench marks, or marked points on the Earth's surface, connected by precise leveling constitute the vertical controls of surveying. The elevations of bench marks are given in terms of their heights above a selected level surface called a datum. In large-level surveys the usual datum is the geoid. The elevation taken as zero for the reference datum is the height of mean sea level determined by a series of observations at various points along the seashore taken continuously for a period of 19 years or more. Because mean sea level is not quite the same as the geoid, probably because of ocean currents, in adjusting the level grid for the United States and Canada all heights determined for mean sea level have been held at zero elevation.

46. Translate the text.

TOOLS AND PRODUCTS OF MODERN GEODESY

Today, the toolbox of geodesy comprises a number of space-geodetic and terrestrial techniques, which together allow for detailed observations of the «three pillars of geodesy» (Geokinematics, Earth Rotation, the Gravity Field) on a wide range of spatial and temporal scales. With a mix of terrestrial, airborne, and spaceborne techniques, geodesy today determines and monitors changes in Earth's shape, gravitational field and rotation with unprecedented accuracy, resolution (temporal as well as spatial), and long-term stability. At the same time, geodetic observation technologies are in constant development with new technologies extending the observation capabilities almost continuously in terms of accuracy, spatial and temporal coverage and resolution, parameters observed, latency and quality. Together, these observations provide the basis to determine and monitor the ITRF and ICRF as the metrological basis for all Earth observations. Equally important, the observaitons themselves are directly related to mass transport and dynamics in the Earth system. Thus, the geodetic measurements form the basis for Earth system observations in the true meaning of these words. Beutler et al. suggested a development towards an interdisciplinary service in support of Earth sciences for the IGS. With the establishment of GGOS, IAG has extended this concept of an observing system and service for Earth system sciences to the whole of geodesy.
It is obvious that there is an intimate relationship between the three pillars of geodesy and the reference systems and frames. For geokinematics and Earth rotation, the relationship works both ways: the reference systems are required for positioning purposes (terrestrial and celestial) and for studying Earth rotation, and monitoring through the space geodetic techniques is necessary to realize the two frames and the time-dependent transformation between them.

47. Translate the text.

Almost 50 years ago, the Venice Charter (International Charter for the Conservation and Restoration of Monuments and Sites, 1964) stated: "It is essential that the principles guiding the preservation and restoration of ancient buildings should be agreed and be laid down on an international basis, with each country being responsible for applying the plan within the framework of its own culture and traditions". But nowadays the need for a clear, rational, standardized terminology and methodology, as well as an accepted professional principle and technique for interpretation, presentation, digital documentation and presentation is still not established. Furthermore, "...Preservation of the digital heritage requires sustained efforts on the part of governments, creators, publishers, relevant industries and heritage institutions. In the face of the current digital divide, it is necessary to reinforce international cooperation and solidarity to enable all countries to ensure creation, dissemination, preservation and continued accessibility of their digital heritage" (UNESCO Charter on the Preservation of the Digital Heritage 2003). Therefore, although we may digitally record and produce models, we also require more international collaborations and information sharing to digitally preserve and make them accessible in all the possible forms and to all the possible users and clients. But despite all these international statements, the constant pressure of international heritage organizations and the recent advances of 3D recording techniques, a systematic and targeted use of

3D surveying and modelling in the Cultural Heritage field is still not yet employed as a default approach for different reasons:

1) the idea of high costs for 3D models;
2) the difficulties in achieving good 3D models by everyone;
3) the thought that 3D is an optional process of interpretation and an additional 'aesthetic' factor, i.e. traditional 2D documentation is enough;
4) the difficulty of integrating 3D worlds with other more standard 2D material;
5) the lack of powerful and reliable software to handle 3D data and produce standard documentation material.

48. Translate the text.

Cadasters and land registration systems

There are various ways in which details about the land may be recorded, reflecting the diverse ways in which land can be viewed. Broadly speaking there have been two approaches, one focusing on its legal aspects and the other on its fiscal or resource potential. The former, called land registration or the land book system, concentrates on the abstract rights associated with the land.

The latter is the cadasters and often contains more evidence about the physical size and shape of areas, and data on land values or land use. Dual and integrated systems exist, depending on the history of the country concerned.

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Land registration is a component of good governance. If wealth is to be generated from land then according to the UNECE report on the Social and Economic Benefits of Good Land Administration (HBP/1998/8, para.5):

"For nations to unlock that wealth requires effective systems of land registration. Good land registration promotes an active land market and productive land use. It makes possible the security of tenure and the development of a mortgage market on which a functioning economy depends."

Land registration provides security of tenure for those whose land is registered. In much of Europe the records of ownership have been maintained in land books, for example the German Grundbuch. Such records identify the piece of land affected, the names of the owners and the particular property rights that are associated with it.

49. Translate the text.

Residential zones may also combine with commercial zones for mixed-use zones with storefronts and residential units. There may be separate categories for transient housing like hotels or dormitories. It's up to each government body to determine how to categorize zoning and restrict land use.

Most land use and zoning laws occur at the local level. The authority to create land use restrictions and zoning law comes from the police powers that are left to each state. The U.S. Constitution gives only limited powers to the federal government. Powers not given to the federal government are left to the states. Each state has the power to pass laws and enforce them as they see fit.

Most states, in turn, delegate zoning and land use authorities to local governments. They believe that local governments are in the best position to manage their own affairs. For that reason, most land use and zoning laws occur at a municipal level.

Land use and zoning attorneys often become very familiar with local laws and regulations. Because the laws are local, there often isn't a great deal of case law interpreting any given ordinance. Attorneys must rely on the plain language of the zoning law or published interpretations of other similar ordinances in order to form arguments for their clients.

50. Translate the text.

Except for control surveys, most other types described are usually performed using plane-surveying procedures, but geodetic methods may be employed on the others if a survey covers an extensive area or requires extreme accuracy.

Ground, aerial, and satellite surveys are broad classifications sometimes used. Ground surveys utilize measurements made with ground-based equipment such as automatic levels and total station instruments. Aerial surveys are accomplished using either photogrammetry or remote sensing. Photogrammetry uses cameras that are carried usually in airplanes to obtain images, whereas remote sensing employs cameras and other types of sensors that can be transported in either aircraft or satellites. Procedures for analyzing and reducing the image data are described further. Aerial methods have been used in all the specialized types of surveys listed, except for optical tooling, and in this area terrestrial (ground-based) photographs are often used. Satellite surveys include the determination of ground locations from measurements made to satellites using GNSS receivers, or the use of satellite images for mapping and monitoring large regions of the Earth.

51. Translate the text.

As a general rule, if an identifiable volume of space is or has been subject to a legal transaction or has been recorded as an independent entity in the registers then it constitutes at least one parcel. In practice in many countries in Europe a basic property unit (BPU) consists of only one parcel. Real property registration systems record BPUs and parcels (if they are not the same object) but only some countries identify the portfolio of ownership as a separate entity. Many countries do not register plots as separate parts of parcels.

Each parcel needs a unique identifier so that data concerning the parcel can be given an exclusive reference. The form of this reference varies from country to country. Within the land book and cadastral systems the identifiers used at present generally reflect historical practice rather than contemporary need. Since almost all land registers and cadasters have been or are being computerized, two types of identifier can be distinguished – one that is needed internally by the computer and the other that is convenient for human beings.

Postal addresses are used for a variety of purposes in many different applications of which land administration is only one. From a land administration perspective it is however desirable that the address can be used to link data from a variety of sources. In particular the references used in the land books, in the cadaster, other government agencies and the municipalities / local government authorities should be compatible. No one specific solution is recommended since conditions vary between countries. Just as there is no unique cadastral solution that fits all countries, so there is no unique address system.

52. Translate the text.

Cadasters are being recognized as the core of land administration systems. The cadastral map should be able to represent complete and comprehensive spatial information for representing land rights, restrictions and responsibilities (RRRs) on the land parcels. However, until today most of countries around the world use 2D land parcels as the base for their land administration systems. Thus 2D projectional presentation of RRRs on land parcels cannot accommodate complex, overlapping real property so needs to be extended to three-dimensional (3D) space and properties. This is becoming more emphasized with the increasing development of urban areas with complex structures, high-rise buildings and underground infrastructures. The rights of cadastral objects may relate to spaces above or below the Earth's surface. More complex relationships in space can no longer be unambiguously mapped onto the Earth's surface in 2D.

Pressure on the land use, especially in the city centers, has led to dense construction with complex structures with intertwined relationships. In general, registration of rights is possible on parts of the building. However, the spatial representation of the extension of rights often does not exist or it is possibly stratified on two-dimensional representation. In addition, an increasing number of tunnels, underground works and infrastructure objects (e.g. water, gas, electricity, telephone, Internet and other pipe networks) under or above land are not owned by
the owner of the land above or below.

53. Translate the text.

The concepts of three-dimensional (3D) real property have been the subject of increased interest in

land use management and research since the late '90s while literature provides various examples of extensive research towards 3D Cadasters as well as already implementing 3D cadastral systems. However, in most countries the legal aspects of 3D real property and its incorporation into 3D cadastral systems have not been so rigorously examined. This paper compares and discusses 3D property concepts in six selected countries: Austria, Brazil, Croatia, Greece, Poland and Sweden, based on the authors' national experience. Each of these countries' legal system is based on different origins of Civil Law, including German, Napoleonic and Scandinavian Civil Law, which can prove useful to research in other Civil Law jurisdictions interested in introducing 3D cadastral systems. Selected countries are on different stages of introducing and implementing a 3D cadastral system; this may contribute to the detection of the main 3D real property concepts that apply as well as deficiencies and malfunctions that prohibit introduction of 3D cadastral systems, highlighting challenges that may have not yet surfaced.

54. Translate the text.

Cadastre is a technical term for a system of records showing the extent, value and ownership (or other basis for use or occupancy) of land. Strictly speaking, a cadastre is a record of areas and values of land and of landholders that originally was compiled for purposes of taxation. In many countries there is, however, no longer any land tax and in practice the cadastre serves two other equally important purposes. It provides a ready means of precise description and identification of particular pieces of land and it acts as a continuous record of rights in land.

A modern cadastre normally consists of a series of large-scale maps or plans, and corresponding registers. Both the plans and the registers may be stored in computers, as discussed in the chapter "computerization of maps and registers". The present chapter deals with the essential features of cadastral maps with particular reference to the form they take when drawn on paper or displayed on a computer screen. While the survey of an individual parcel of land has in some countries resulted in a "cadastral map" for that plot of land and may have been unconnected to any adjoining land parcels, the true cadastral map covers all parcels within an area rather than isolated plots. It can act as an index for other land parcel surveys that show more detailed information or can be of sufficiently large scale for the dimensions of each plot to be obtainable from the map. In this chapter, and throughout this monograph, the term 'cadastral map' will be associated with any parcel of land whether defined by ownership, value or use provided that the parcel has an independent identity and is relevant to the management of land as a resource. A cadastral map will show the boundaries of such parcels but may in addition incorporate details of the resources associated with them, including the physical structures on or beneath them, their geology, soils, and vegetation and the manner in which the land is used.

The scale of cadastral maps is of great importance. Since the object of the map is to provide a precise description and identification of the land, the scale must be large enough for every separate plot of land which may be the subject of separate possession (conveniently called a "survey plot" or "land parcel") to appear as a recognizable unit on the map. When map data are stored in a computer, they may be drawn at almost any scale and this can give an impression of greater accuracy than the quality of the survey data may warrant.

55. Translate the text.

Since the map and the corresponding registers form complementary parts of the same system of description and identification, there must be some system of cross-referencing between what is shown on the map and what is recorded in the registers. This usually means that either names or numbers must be given to each separate land parcel. These references are known as property identifiers (PID) or unique parcel reference numbers (UPRN). Various reference systems have been developed including:

a. The name of the grantor or grantee
b. A sequential title number
c. The volume and folio numbers on which the plot is registered
d. The name of a farm or locality with an individual plot number
e. The registration block and individual plot numbers

f. A post office address
g. A street index reference and parcel number
h. A grid coordinate or “geocode”

The reference chosen should be easy to understand and easy to remember; easy to use for the public and by computers; permanent so that it does not change with the sale of a property, but capable of being updated when there is for example a subdivision of the land; unique; accurate; and economic to introduce.

It is essential that when these numbers or names are drawn on a map that they do not obscure the details of the map itself. The cadastral map should show the boundaries of each land parcel and in some jurisdictions may also show its area and the actual length and bearing of each boundary line. These considerations may obviously demand a scale somewhat larger than that required merely to indicate each surveyed plot.

The smallest satisfactory scale depends primarily on the area of the smallest survey plot likely to be met with, and may thus vary greatly in different circumstances. A much larger scale will be necessary for cadastral maps of towns than for those of rural areas. Similarly a closely occupied countryside consisting of small fields and holdings will require maps on a larger scale than is necessary in areas where there are large farms with open fields.

56. Translate the text.

The maps with which most people are familiar are topographic maps at scales of around 1:50,000. Such maps make it possible to show accurately (though not always to scale) the position of roads, railways, footpaths, villages, rivers, streams, bridges, important buildings, administrative boundaries and other similar features as well as the relief of the land, the depth of water and variations in tide level. These maps are however quite inadequate for cadastral purposes. A simple example will make this point clear. A carefully drawn pencil line will have a width of perhaps half a millimetre. On a map on the scale of 1:50,000 this would represent a line of 25 metres wide of the ground. There are many countries, especially hilly countries, with separate fields less than 25 metres wide. Most cadastral maps need to be at scales of between 1:500 and 1:2,500 although in densely developed areas a larger scale may be needed while in open countryside much smaller scales may be acceptable. Large-scale plans are initially much more expensive to make per unit area than small-scale maps, but it must always be remembered that, once the large- scale survey has been completed, accurate maps on any smaller scale can be derived from them. The converse is not however true for although larger-scale maps can easily be constructed by using computers, they can never be more accurate than the original data from which they were first compiled.

Usually cadastral maps need only be “planimetric” maps, that is to say, they need not show topographical relief. There may be special reasons why altitudes should be recorded on cadastral maps, but ordinarily all that is needed is a plan of what is seen, without stereoscopy, from a point vertically above the piece of land observed. Distances recorded on such plans are the horizontal distances between points and not the surface distances actually measured on the ground. Thus the area recorded for a plot of land on a steep hillside will be the horizontal equivalent which may be significantly less than the actual surface area.

57. Translate the text.

A third important requirement of cadastral maps is that they should show a sufficient number of points which can be accurately identified on the ground to enable any other point on the ground to be identified on the map (or vice versa) by eye or by simple and short measurements. Professionally this requirement is satisfied by marks recording the original triangulation stations, or the stations on supplementary theodolite traverses, but this is usually inadequate or inconvenient for practical purposes. In areas where there are permanent fences or fields surrounded by embankments, the fences and banks may provide an adequate means of detailed identification, but in unfenced open

fields without any embankments, some means of indicating the land parcel boundaries on the ground will be necessary.
A good mark must be durable in itself and not easy to remove either accidentally or willfully. In many countries it is also desirable that the material of which it is made should not be of a kind that encourages theft. Since the marks must be easily recognizable they must be fairly conspicuous on the surface but for important points, such as those used as control for surveys, there are advantages in supplementing surface marks with marks that are set in concrete and buried beneath them.
One principal method of identification used in cadastral maps is the “grid”. In some countries, such as much of the public lands in the United States, a grid has been laid out on the ground creating a “rectangular system”. All parcels of land are formed by straight lines, often running north to south and east to west. The problem with such a system is that it is unsympathetic to the natural topography but its advantage is its simplicity and the relative clarity of the boundaries on the ground. More commonly however a grid is used as a referencing system so that the coordinates of all boundary turning points can be measured, calculated and recorded. The data can then be stored in a computer and used either to draw the cadastral maps or else for helping a surveyor to re- establish lost boundary marks.

58. Translate the text.

Air surveys and cadastral maps
There are two ways in which maps may be produced from primary sources. One is by ground survey and the other by air survey, that is by taking measurements from aerial photographs. Points identified on overlapping aerial photographs may be transformed into positions on maps either by mechanical analogue means or through the use of mathematical techniques. The processes, known as photogrammetry, require some ground measurements to be taken in order to establish the precise scale and orientation of any map in relation to the ground data. The quality of modern instrumentation is now so good that in conjunction with computerized techniques and aerial triangulation, the ground control points that must be provided are relatively few. The actual number depends on the size and shape of the area to be mapped, the accuracy required, and the scale of the photography. The latter varies across a photograph since it is equal to the ratio between the focal length of the air survey camera (f) and the flying height of the aircraft (H) above any ground point (h); mathematically:
the scale at any point = f/(H-h).
Since the height of the terrain (h) varies across an area, then so does the scale of the photography.
Photogrammetry can be used to establish a greater density of control points from which it is then possible to compile detailed topographic maps. The outline of features as seen from the air, together with contour lines, can be identified and traced with great ease and economy. Under suitable conditions, photogrammetry can produce maps and measurements that are as accurate or even more accurate than those obtainable by standard ground methods.
While photogrammetric techniques have been extensively used for topographic mapping, they have contributed less to cadastral surveying. In favourable circumstances, for example where there are rice lands with embankments around their edge, terraced hill lands, or land enclosed with well- marked hedges or walls, the photographs may be able to supply all the field detail needed for the cadastre. In other cases this may not be so - for instance in some open field systems where cultivation of the same crops is carried out by different land holders more or less continuously over a wide area, or in some areas under tree cover. The aerial photographs may show temporary detail, for example the divisions of a single field between crops, or details within the survey plot such as minor internal drainage ditches. These should not or need not appear on the cadastral map but may be difficult to distinguish from permanent field boundaries on the photographs.

59. Translate the text.

In many circumstances the legal boundaries of holdings cannot be determined from the photographs without extensive checking on the ground. Generally more work will be required to supplement the photographs in the case of cadastral maps than in the case of most topographical mapping. Nevertheless the techniques can be as accurate as, and significantly cheaper than, undertaking a

survey entirely by ground survey methods.
One of the great disadvantages of air survey is that, except for the ground control marks that are part of the basic geodetic framework, it does not leave permanently demarcated points on the ground. A large number of these are often required for an efficient cadastral survey in order to facilitate subdivision work and the future re-establishment of missing boundary features. In ground surveys most theodolite or other survey stations are, or can be, simply and permanently marked by buried pipes or concrete beacons as the work progresses. This system makes it possible to reconstruct any part of a minor triangulation or traverse at any time, a fact of obvious advantage when identifying by measurement any unmarked points or during revision of the survey. In the case of air surveys, the provision of additional ground marks will need to be done independently, often at considerable cost.
In all cadastral surveys undertaken by photogrammetry there is a need for follow-up ground surveys to check the actual location of legal boundaries that may not be visible on the photography or may have been wrongly identified.
Survey work of all kinds tends to be expensive and the precise comparative cost of air and ground methods can usually only be determined with regard to particular cases. Air survey methods benefit from economies of scale where a large number of boundaries or points of detail have to be recorded. The capital and running costs of aeroplanes and the equipment used in aerial surveys are high, and the personnel required are highly skilled and relatively well paid in comparison with some field surveyors. The number of days in the year on which flying can be done is normally quite small but then in many countries the number of days on which field survey work can be carried out is restricted for climatic reasons though not so much as for flying.

60. Translate the text.

A different approach to producing cadastral maps is through the use of stereo-plotting machines. These may be used either to show the physical features which coincide or coexist with the legal boundaries or to locate points of detail that can be used as control for simple ground surveys. Cadastral maps can then be compiled from a combination of photogrammetric plotting of physical details that are visible from the air with simple graphical methods of survey to locate specific land parcel boundaries. The resulting product would then be to graphical standards of accuracy, that is to the equivalent of the thickness of a line drawn on the map.
Many countries, however, insist on numerical information for their cadastral surveys and this has resulted in separate topographic and cadastral mapping, leading to duplication of effort even within a national survey department. In urban areas, it is not uncommon to find that large scale topographic mapping has been produced photogrammetrically for the purposes of planning and general land management while cadastral plans of the same area have been compiled separately from independent ground surveys. This separation of function between cadastral and topographic surveying is symptomatic of the polarization that has taken place between advocates of ground and air surveys with a resulting lack of homogeneity in the data.
Photogrammetric techniques can be used to produce numerical coordinate data through the use of analytical stereo plotters or comparators. These produce coordinates for points on the air photographs from which the ground coordinates can be calculated. The accuracy of such coordinates depends upon the equipment used but can be similar to that achieved by ground survey - in Germany and Switzerland, for example, such techniques have been successfully used to revise cadastral maps.
The great advantage of air survey over ground survey is the speed and hence the enormous amount of time that can be saved.
In setting up a cadastral system there are obvious advantages in using photogrammetric techniques where the boundaries of parcels are visible from the air or where relatively cheap and stable marks can be emplaced of sufficient size that they can be seen clearly on the photographs. In the case of small areas and when adding to or revising an existing survey, the advantage of speed is much less, and must in any event be weighed against increased costs. The latter are due not only to the higher proportion of time spent in the air in relation to the amount of photography done, but also to the expense of setting up the necessary ground controls for a small job.